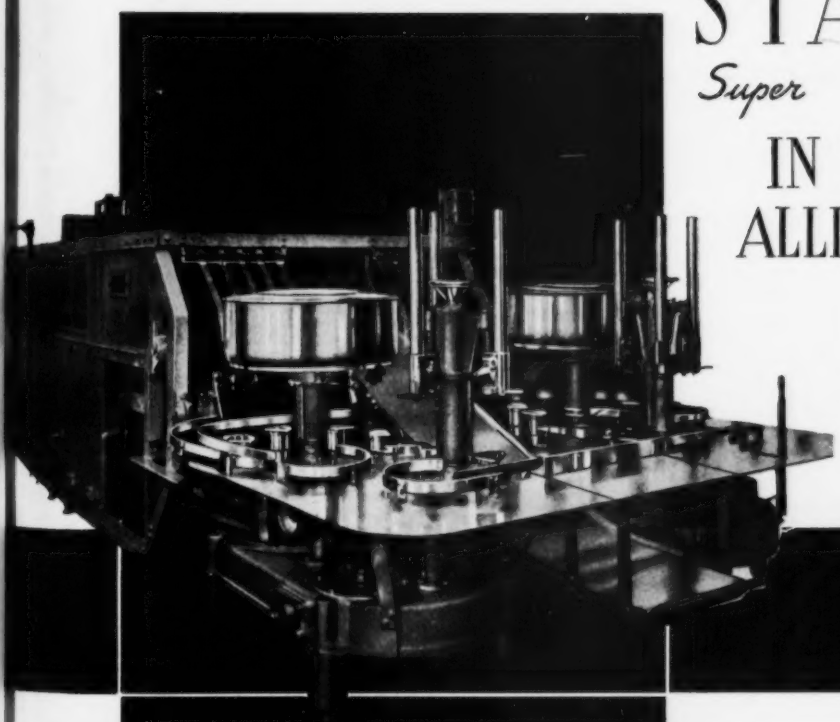
FOOD MANUFACTURE

Incorporating Food Industries Weekly

ILIARD HILL LIMITED, 37, STRATFORD PLACE, LONDON, W.1 APRIL 1, 1946

"STAYBRITE"
REG. TRADE MARK
Super Stainless Steel

IN THE DAIRY & ALLIED INDUSTRIES



Owing to the large demand we are at present greatly restricted as regards the purposes for which this steel can be supplied.

IRTH-VICKERS STAINLESS STEELS LTD SHEFFIELD

TRUSOY
Soya FLOUR

Supplies are now available

PROTEINS . 43·50%
FAT . . 20·50%
CARBOHYDRATES 20·00%
ALL EXTREMELY IMPORTANT IN FOOD PRODUCTION TO-DAY

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Telephone:
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Sales Office: **CHANTRY VILLA, CHANTRY ROAD.** Bishops Stortford. Herts.

All enquiries for Scotland to be sent to: Thomas Howden, Ltd., Cragentinny Avenue North, Leith, Edinburgh. All other enquiries direct to this address. Recipes and practical advice can be had on application from our representatives who cover all districts.

INSTRUCTION AGAIN.

Hope you don't mind.

Perhaps you'll be interested !

TREATMENT OF MODERN THERMOMETERS

All our Thermometers, at any price, are now Nitrogen filled.

This means that if the Mercury column separates by vibration in transit, the parts of the column are separated by a bubble of Nitrogen.

In the old evacuated Thermometers there was no actual matter separating the parts, and the column could normally be rejoined by warming up the bulb or reversing and shaking.

With the modern Thermometer, the bulb should not be warmed, IT MUST BE COOLED.

The correct procedure is to cool the bulb, in a freezing mixture if necessary, until the column and the broken part all go into the bulb or expansion bulb near the bottom. The bubble of Nitrogen then escapes and joins the Nitrogen in the tube, and all is normal again.

You can tell if a Thermometer is Nitrogen filled or not by seeing if the broken piece of Mercury follows the main column down into the bulb. It does not do this if it is evacuated.

Remember that to give a really quick response, a Thermometer must be thin. The better the Thermometer, the more carefully it should be handled.

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390 SYDENHAM ROAD, CROYDON

Telephone : Thornton Heath 3851 Telegrams : Townson, Croydon

— FOR — *"Service to Science"*

Index to ADVERTISERS

	PAGE
Agricultural and Chemical Products, Ltd.	lx
Albro Fillers, Ltd.	xxviii
Alfa-Laval Co., Ltd.	Mar.
Allen, Stafford, & Sons, Ltd.	xxv
Aluminium Plant and Vessel Co., Ltd.	xlii
Ashe Laboratories, Ltd.	Mar.
Automatic Weighing & Packing Co., Ltd.	l
Baldwins, Ltd.	Mar.
Barron, W. S., & Son, Ltd.	Mar.
Benjamin Electric, Ltd.	xxxix
Bertrams, Ltd.	xlv
Beth Label & Wrapper Machines, Ltd.	Mar.
Blackwell Hayes & Co., Ltd.	lvi
Blandola Co., The, Ltd.	Feb.
Boehm, Fredk., Ltd.	xiv, xlix
Bolton's Superheater & Pipeworks, Ltd.	xli
Brainos & Co.	l
Brehmer's, Aug. (British), Successor, Ltd.	xx
Brierley, Wm., Collier & Hartley, Ltd.	xlvii
Bristol's Instrument Co., Ltd.	Mar.
British Arkady Co., Ltd.	xx
British Fermentation Products, Ltd.	liv
British Filters, Ltd.	xxii
British Ratin Co., Ltd.	xxvi
British Soya Products, Ltd.	Inside Front Cover
British Steam Specialties, Ltd.	l
British Thomson-Houston Co., Ltd., The	x
Broadbent, Thomas, Ltd.	Mar.
Brooks, R., & Co.	lviii
Brown & Rawcliffe, Ltd.	Mar.
Brush Electrical Co., Ltd.	vi
Bryan, W., Ltd.	lix
Burma Teak Shippers	xxxviii
Bush, W. J., & Co., Ltd.	xiii
Butterfield, W. P., Ltd.	xxix
Callow Bros., Ltd.	lix
Cambridge Instrument Co., Ltd.	xliii
Cameron Can Machinery Co.	Mar.
Canning Town Glass Works, Ltd.	xlviii
Chater, Joseph, & Sons, Ltd.	xxvi
Cheverton & Laidler, Ltd.	xxxvi, lx
Clark, R. I., Ltd.	xxiv
Clark, T. & C., & Co., Ltd.	Mar.
Cohen, Geo., Son & Co., Ltd.	lx
Cochran & Co. (Annan), Ltd.	Mar.
Cole, E. K., Ltd.	Feb.
Crane, Ltd.	Mar.
Crofts (Engineers), Ltd.	liii
Crompton Parkinson, Ltd.	Mar.
Cumming, Parsons, Ltd.	xlvii
Danks (Netherton), Ltd.	Mar.
Dawson Bros.	Mar.
Dewey & Almy, Ltd.	Inside Back Cover
Distillers Co.	Mar.
Drayton Regulator & Instrument Co., Ltd., The	Back Cover
Dubuis & Rowsell, Ltd.	l
Duché, T. M., & Sons (U.K.), Ltd.	lxi
Dutton, Leonard, & Sons	lxii
Edme, Ltd.	lviii
Elliott Bros. (London), Ltd.	lii
Ellison Insulations, Ltd.	lx
Ellison, Geo., Ltd.	v
Evans, Adlard & Co., Ltd.	lix
Evans, Wm., & Co. (Hereford & Devon), Ltd.	xliv
Evertaut, Ltd.	lii
Firth-Vickers Stainless Steels, Ltd.	Front Cover
Ford Motor Co., Ltd.	Mar.
Fraser, John, Ltd.	Mar.
Fry's Metal Foundries, Ltd.	Mar.
Fuller, Horsey, Sons, & Cassell	lviii
Gardner, Wm., & Sons (Gloucester), Ltd.	xxvii
G. C. Engineering Co., Ltd.	Feb.
General Electric Co., Ltd., The	xvi, xxxiii
Gerrard Industries, Ltd.	Mar.
Gledhill Brook Time Recorders, Ltd.	lvi
Gloy and Empire Adhesives, Ltd.	liii
Gosheron, John, & Co., Ltd.	lxi
Griffith Hughes, E., Ltd.	Mar.
Hall, J. & E., Ltd.	Feb.
Hamburger, M., & Sons, Ltd.	liv
Harley, Thos., Ltd.	lviii
Holden, Arthur, & Sons, Ltd.	viii
Holden & Brooke, Ltd.	lvi

[Continued on p. vi

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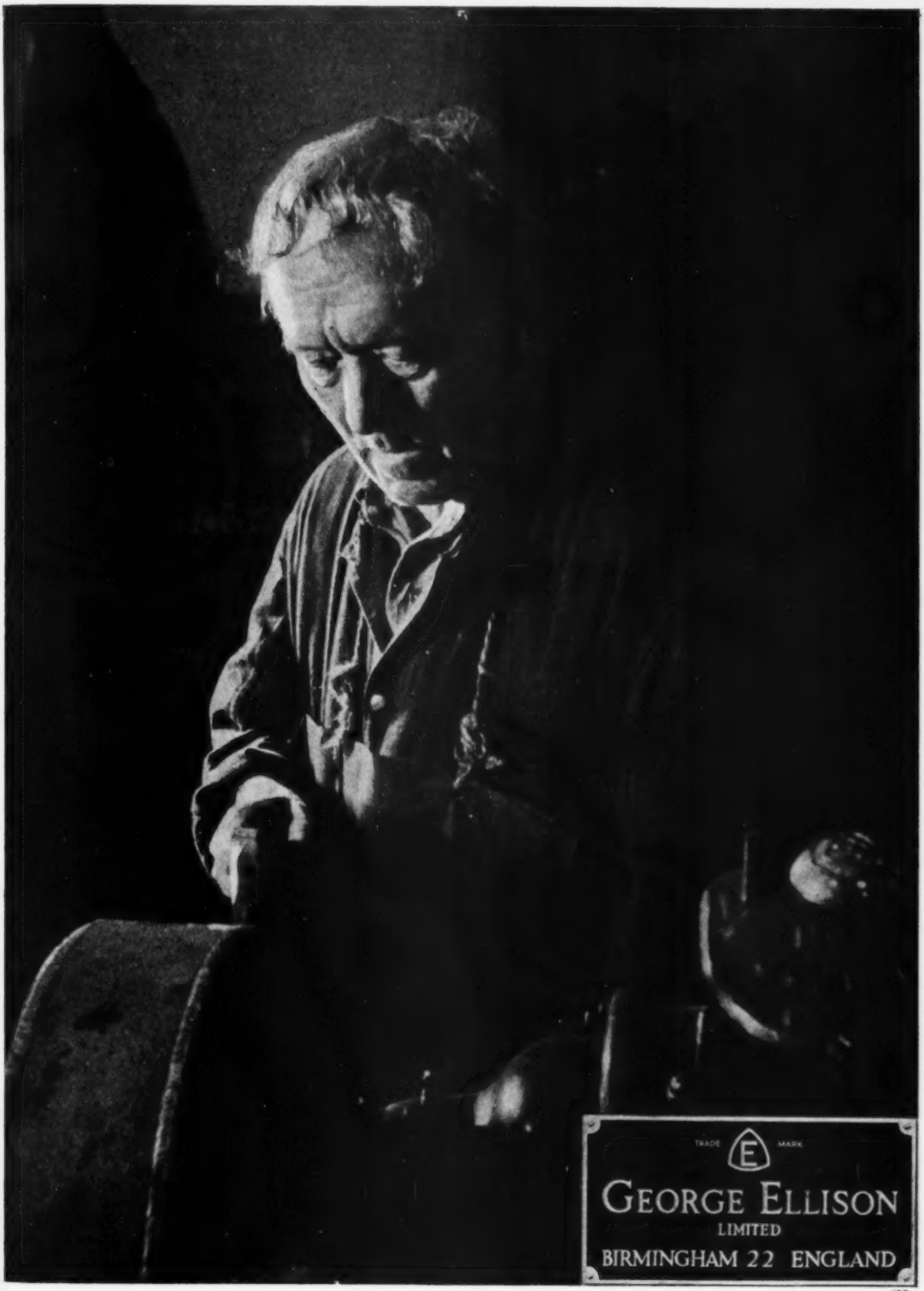
TRADE MARK
GEORGE ELLISON
LIMITED
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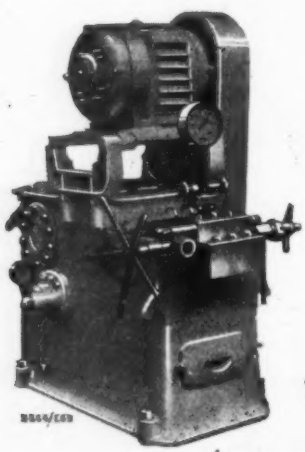
Index to ADVERTISERS

	PAGE
Honeywill & Stein, Ltd.	xi
Hopkinsons, Ltd.	xxxvii
Horton Mfg. Co., Ltd.	Mar.
Imperial Chemical Industries, Ltd.	xxiv
Jackson, J. G., & Crockatt & Co.	liv
Jobling, James, Ltd.	xxii
Johnson, A., & Co., Ltd.	xxxv
Johnson, S. H., & Co., Ltd.	xlviii
Jones, Samuel, & Co., Ltd.	lxii
Kellie, Robert, & Son, Ltd.	xii
Kestner Evaporator and Engineering Co., Ltd.	xxxvi
Key Engineering Co., Ltd., The	lviii
Lambert, L., & Co.	xxviii
Lautier Fils, Ltd.	xlv
Lax & Shaw, Ltd.	lv
Lewis, H. K., & Co., Ltd.	Mar.
London & Lancashire Assurance Co., Ltd.	xxxvi
Magneta Time Co., Ltd.	liii
Magnetic Valve Co., Ltd.	lvi
Manesty Machines, Ltd.	Mar.
Marconi Instruments, Ltd.	xxx
Marshall's Malted Milk, Ltd.	iv
Medway Corrugated Paper Co., Ltd.	Mar.
Mellor, Bromley & Co., Ltd.	xviii
Midland Bank, Ltd.	Mar.
Mitchell, L. A., Ltd.	Mar.
Moon Bros., Ltd.	Mar.
Moore, Charles, Ltd.	xi
Morton Machine Co., The	xv
Morton, Robert, & Co., Ltd.	xlviii
Musgrave & Co., Ltd.	Mar.
National Adhesives, Ltd.	Mar.
Negretti & Zambra, Ltd.	xlix
Newton Chambers, Ltd.	xvii
Northern Aluminium Co., Ltd.	xlx
Pearlite Box Co., Ltd.	Mar.
Perkin & Co., Ltd.	xxxiv
Philips Lamps, Ltd.	vii
Polak & Schwarz, Ltd.	Jan.
Poppe Rubber & Tyre Co., Ltd.	xxxii
Porteus, G., & Sons	xxx
Premier Colloid Mills, Ltd.	xlvi
Premier Filterpress Co., Ltd.	Mar.
Prodorite, Ltd.	Mar.
Pulsometer Engineering Co., Ltd.	lxii
Purdy Patent Machinery Co., Ltd.	li
Radiovisor Parent, Ltd.	Feb.
Rat Campaign	lvii
Reavell & Co., Ltd.	lviii
Rhodes, George, & Sons, Ltd.	lviii
Riddell, Cousland & Co., Ltd.	lii
Robey & Co., Ltd.	Feb.
Rownson, Drew & Clydesdale, Ltd.	Mar.
Rubber Latex, Ltd.	lxi
Ryvita, Ltd.	xxxiv
Sarco Thermostats, Ltd.	lvii
Saunders Valve Co., Ltd.	liv
Seal-less Strapping, Ltd.	xl
Short & Mason, Ltd.	xxxi
SMALL ADVERTISEMENTS	lix-lxi
Soflor, Ltd.	xxxviii
Soya Foods, Ltd.	li
Sozol (1924), Ltd.	lxii
Spencer-Hopwood, Ltd.	lviii
Spiral Tube & Components Co., Ltd., The	lx
Spirax Mfg. Co., Ltd.	xxi
Stevenson & Howell, Ltd.	xliv
Sturge, J. & E., Ltd.	lx
Sturtevant Engineering Co., Ltd.	xxxiv
Tecalemit, Ltd.	xxxii
Thackray, C. F., Ltd.	Mar.
Thames Board Mills, Ltd.	lx
Thomas & Bishop, Ltd.	Mar.
Townson & Mercer, Ltd.	iii
United Glass Bottle Co., Ltd.	Mar.
Walker, Crosweller & Co., Ltd.	lv
Walworth, Ltd.	Feb.
Weir, G. & T., Ltd.	Mar.
White, Tomkins & Courage, Ltd.	xxiii
Whittaker, A.	lx

HOMOGENISATION Improves Food Products



The use of substitutes in processed food is unavoidable to-day. The problem of the manufacturer is to maintain the "Appeal to the Palate" and improve the keeping quality. You can do this with

BRUSH

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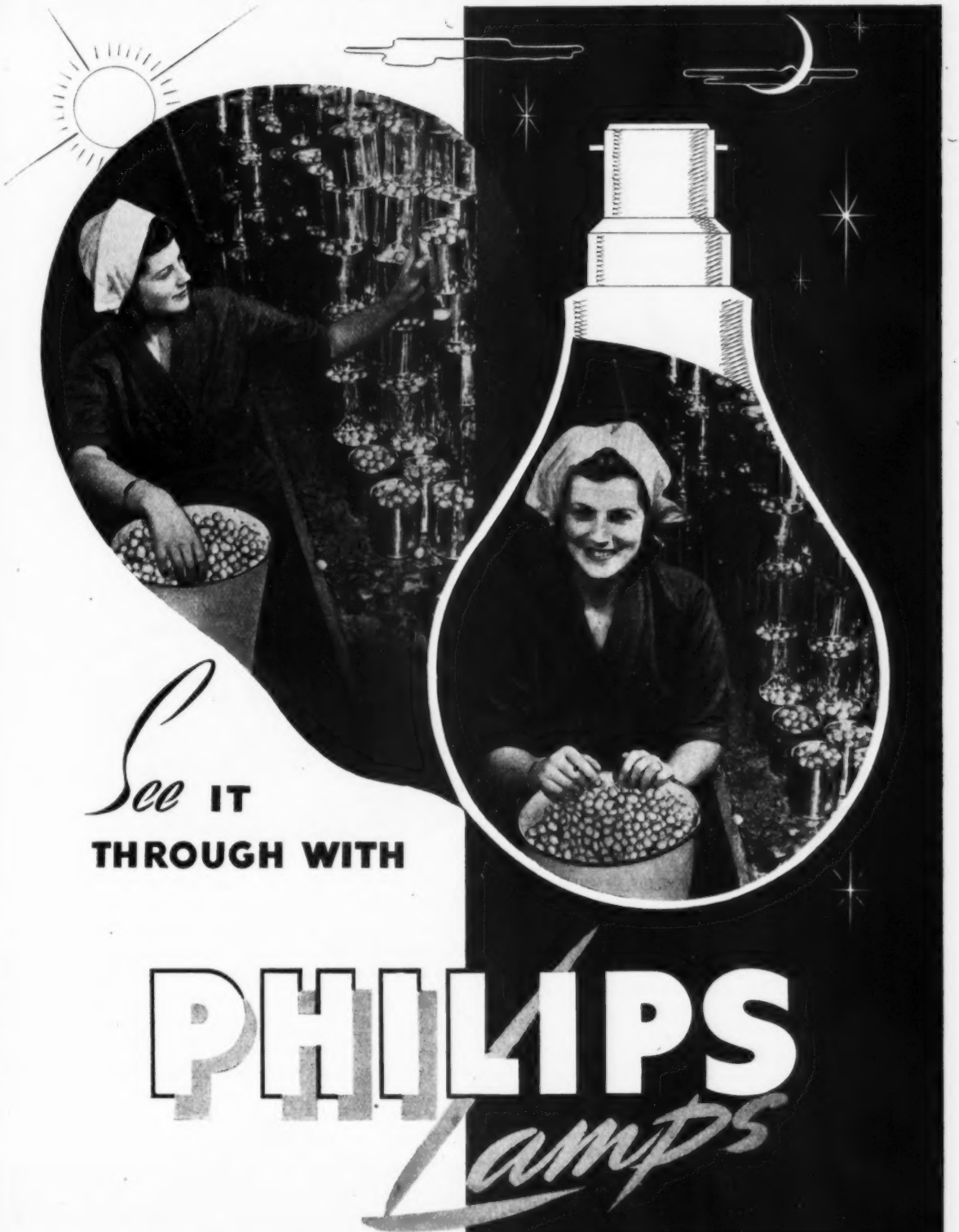

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SUPER ZINNATINE

Anti-acid, non-poisonous gold coating, preserves the rich fresh colour and flavour of fruits.

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The sulphur-resisting Zinnatine, prevents those blackening stains in vegetable packs.

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Preserves the fresh sea flavour of fish, and provides a lacquer film that will not fracture in the process of deep drawing.

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is controlled by the Government for the packing of commodities essential to the National effort including supplies for the

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MADE BY BRITAIN'S LARGEST

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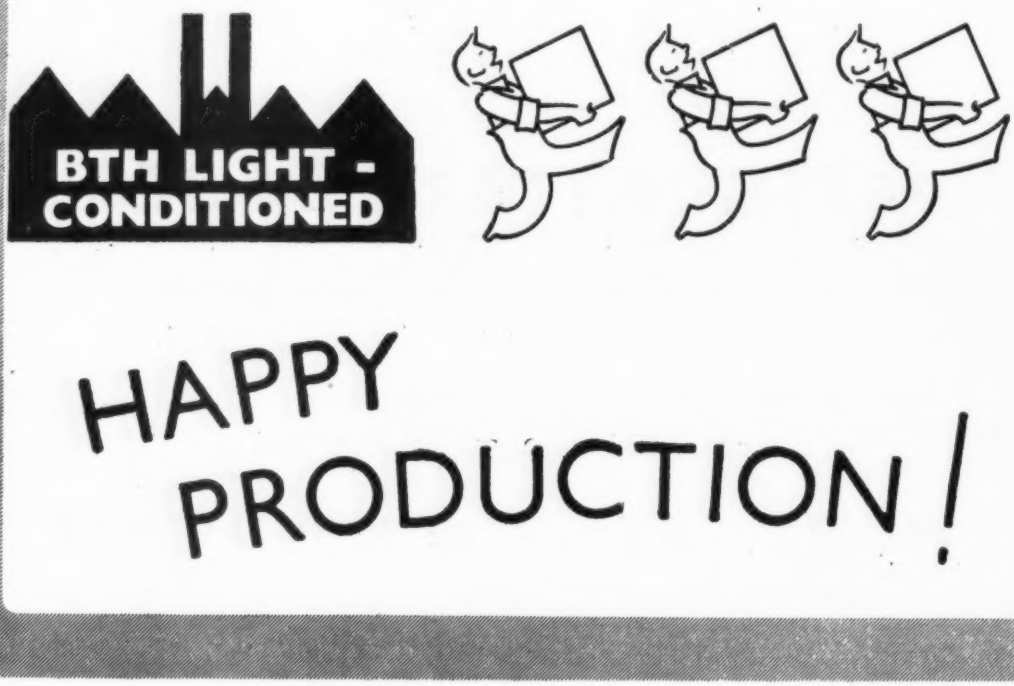
THAMES BOARD MILLS LTD., PURFLEET, ESSEX



To produce happily, the worker must be able to work at maximum speed and in the knowledge that no fault or omission can escape his eye. Only good lighting can ensure this. The B T H Light-Conditioning Code (copy sent on request) embodies the seven fundamental rules which govern all B T H plans for the better lighting of industry.

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MAZDA Lamps
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WHITE? *Absolutely*, as you can see for yourself. Pure? Yes, 99.98% pure. This too you can see for yourself on the signed guarantee. Look for the Lymm-Pure-Salt guarantee of purity on every invoice for salt.

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Rotary Syrupers
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Boiling Pans (all types), in Cast Iron, Copper, Monel Metal, Stainless Steel, Pure Nickel, Inconel, etc.
Exhausters (steam and or water) Disc or Rotary type
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Original inventors and sole makers of the KELLIE-YATES Filtration Process of Fruit Preservation. The hygienic, scientific and economical modern method of making Jams, Jellies, Marmalades, Pectin, Sugar Syrup, Fruit Juices, etc. Over 100 complete installations are now in operation in Preserve Factories throughout the world producing high-class preserves of finer flavour and greater clarity at a fraction of their former manufacturing costs.

"KELLIE" Improved COMBINED STEAM AND/OR WATER EXHAUSTER

(Type I E.C.)

Motor Driven with Infinitely Variable Speed Gear giving exhaust periods of 3 to 9 minutes.

Three double run 12 in. disc type. Capacity 450 A.2½ Cans. Will handle any size of can up to 4½ in. diameter without change.

Disc Type

Specification

Capacity: 450—No. A.2½ Cans.
Exhaust periods: Anything between 3 and 9 mins.
Overall length: 19 ft. 5 in.
,, width: 7 ft. 4½ in.
,, height: 5 ft. 7½ in.
Size of Exhaust Box: Inside length 17 ft. 8 in.
,, width 6 ft.
,, depth 1 ft. 10 in. to
Size of Steam Pipe: 11 in. dia. [2 ft. 2 in.
,, Drain ,, 3 in. dia.
,, Overflow ,, 3 in. dia.
Height of delivery and feed tables from floor: [2 ft. 6 in.
Power required: 2 B.H.P.
Nett weight: 80 cwts.

THIS Exhauster is provided with direct coupled Electric Motor Drive through our Infinitely Variable Enclosed Speed Gear Box, providing any desired exhaust period of 3 to 9 minutes, instantly obtainable while the machine is running. Control is by Push Button Switch Gear at delivery end of Exhauster.

This machine, it should be added, is not merely a Water Exhauster which may be converted to Steam, or *vice versa*, but a new type altogether permitting the use of Steam or Water at will and, in conjunction with the variable exhaust period, is ideally suited for all kinds of Food Products.

Recording Regulators and Temperature Control Instruments are recommended and fitted as extras.

To facilitate erection and handling at client's factory the Exhauster is constructed in two sections, jointed and bolted together. All driving gears are machine cut and totally enclosed.

This combined Steam and/or Water Exhauster is undoubtedly a step in advance of anything hitherto offered to the Canning Industry.

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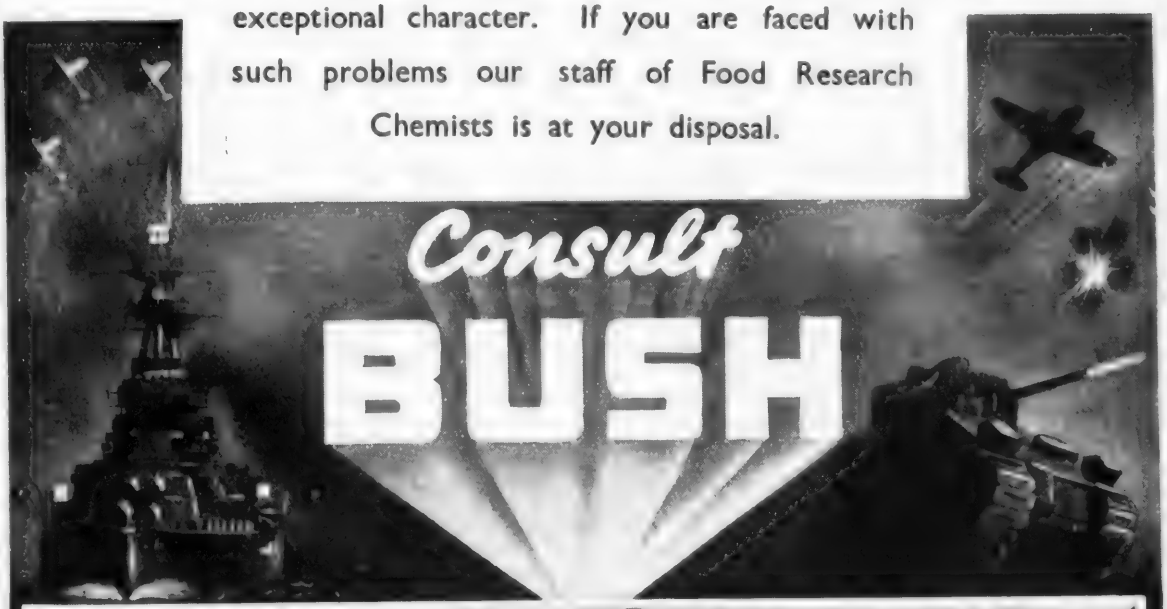
The need for revising formulae in the absence of the usual raw materials presents to the Food Manufacturer flavour problems of an exceptional character. If you are faced with such problems our staff of Food Research Chemists is at your disposal.



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A Concentrated Extract with high Amino Acid content. Manufactured by Fredk. Boehm Ltd.

As a base, incorporated in foodstuffs, PROTEX has been accepted as a standard ingredient by the leading food manufacturers and is valued chiefly for its power of enhancing the characteristic flavour of almost any food preparation.

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A Yeast Extract manufactured by the Trent Yeast Extract Co. Ltd., from Brewers' Yeast. Rich in Vitamin B. A most highly concentrated food, easily digested with the highest nutritional and health value. Possessing a pleasant aroma and flavour.

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FAMOUS THROUGHOUT
THE WORLD!

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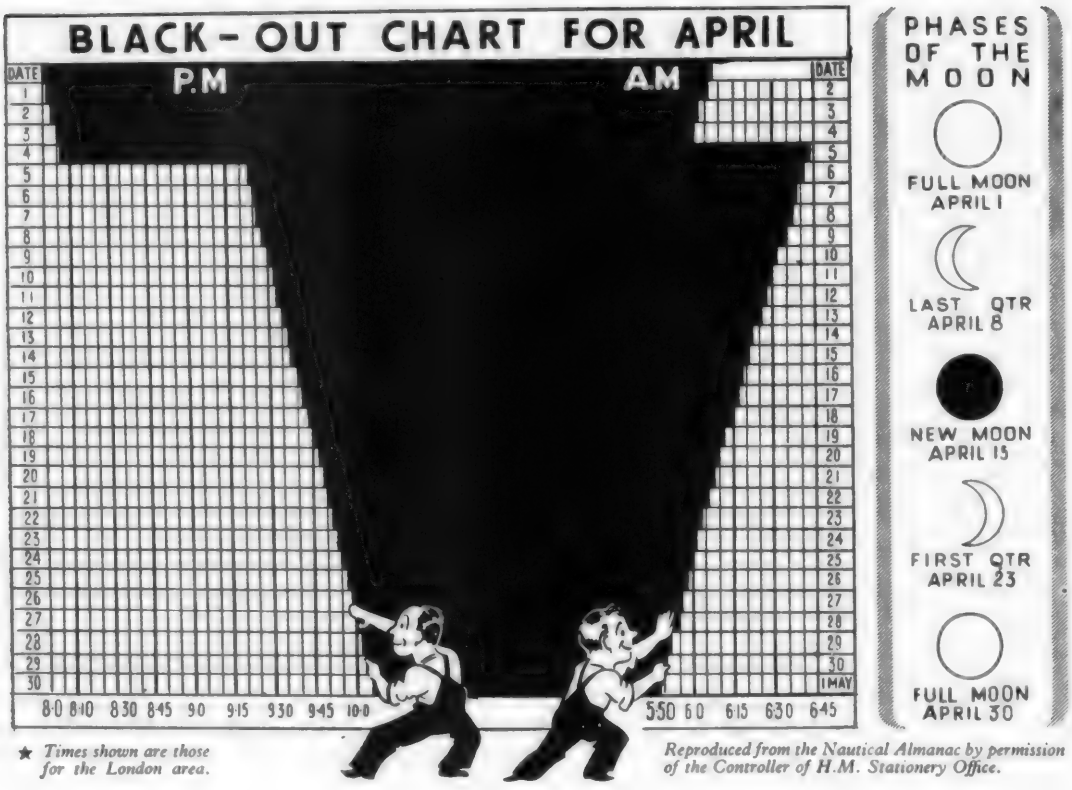
That Extra Hour



★ *Times shown are those for the London area.*

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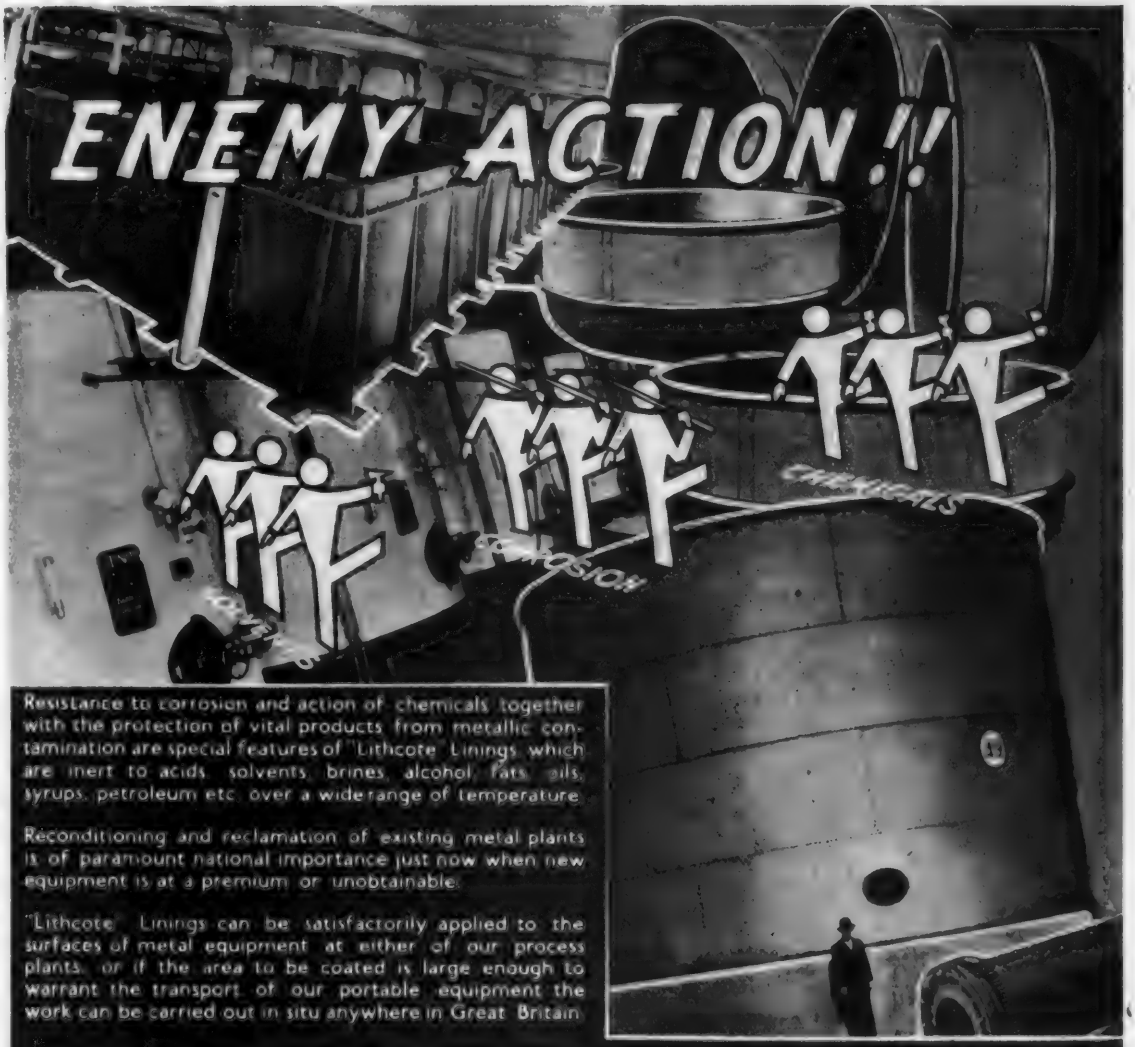
Double Summer time comes in a month earlier this year which will be encouraging to the workers, and beneficial to output. In the factory, however, working twenty four hours a day, April means still 261 hours of black-out. Since no-one can see to work in the dark, good lighting is of the greatest importance, and it pays to see that it is supported always by dependable OSRAM lamps.

Osram

A G.E.C. PRODUCT

THE WONDERFUL LAMP

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2



Resistance to corrosion and action of chemicals together with the protection of vital products from metallic contamination are special features of "Lithcote" Linings which are inert to acids, solvents, brines, alcohol, fats, oils, syrups, petroleum etc. over a wide range of temperature.

Reconditioning and reclamation of existing metal plants is of paramount national importance just now when new equipment is at a premium or unobtainable.

"Lithcote" Linings can be satisfactorily applied to the surfaces of metal equipment at either of our process plants, or if the area to be coated is large enough to warrant the transport of our portable equipment the work can be carried out in situ anywhere in Great Britain.

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REGD

The lasting protective lining and coating

• corrosion-proof • solvent-proof • acid-proof • durable • sterile

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ASSOCIATES AND LICENSEES FOR WEST MIDLANDS, WALES AND SOUTH WESTERN AREAS

PRODORITE LTD.,

Eagle Works, **WEDNESBURY.**

— PROCESSING PLANTS AT BOTH THE ABOVE WORKS —

"Rome wasn't built in a day!"

. . . nor will the reconstruction of Britain be completed in a year . . . but if we are to build a newer, cleaner Britain that our children and their children will be proud of, we must build with vision! Architect and scientist, engineer and builder, must co-operate . . . the ordinary man and woman must see that this co-operation be applied intelligently to constructing a country in which everyone can live in content ment. Makeshifts will no longer satisfy . . . old-fashioned buildings adapted into flats or offices must pass away . . . modern constructional methods must be adopted in the new buildings . . . and in this modern, clean Britain, clean temperate air must be supplied to all buildings whether industrial or residential.

Mellor Bromley Air Conditioning Division have not been to see you recently . . . petrol shortage . . . the call of the services . . . and pressure of work have made business calls difficult—but when Peace comes—Mellor Bromley Air Conditioning Division will be ready to supply you with newer and more scientific air conditioning plant.

AIR CONDITIONING DIVISION

MELLOR BROMLEY & CO. LTD. MINOTAUR WORKS ST. SAVIOUR'S RD. **LEICESTER**

Another Step towards Victory

MIGHTIER YET!

from a painting by FRANK H. MASON, R.I.

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An .. Arkady Product

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Our Superfine SOYA FLOUR for Bread

1. Improves the sheen on the crumb and bleaches the colour.
2. Mellows the dough — making it easier to mould.
3. Gives a moister and more velvety crumb.
4. Improves the keeping qualities of the bread.

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SKERTON ROAD · OLD TRAFFORD · MANCHESTER 16

BREHMER'S

CONTAINER WIRE-STITCHER, No. 57½

This machine serves for wire stitching the bottoms of single piece corrugated or solid board containers. The pillar type Anvil has 30-in. maximum reach and suffices for firmly fastening the bottom flaps with wire stitches automatically formed, driven and clinched from a reel of Ribbon Stitching Wire 12 by 25 or 12 by 26 gauge. An interchangeable top stitching tongue with adjustable work-table can also be supplied for wire stitching, also the tops of the filled containers in place of taping. Supplied in three styles, viz.: For Treadle use, Line-shaft drive, or self-contained direct motor drive. Speed to 150 stitches per minute.

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How much coal will lagging save ?

WHEN COAL WAS CHEAP and easy to get, many a steam pipe went unlagged simply because lagging seemed too expensive.

It is a different story today. Lagging is still expensive, but not so expensive as the coal that is wasted making steam-heat to be lost through bare piping.

The amount of coal lost through uncovered steam-piping is astonishing. Perhaps these few figures will be an eye-opener:

Based on 100 feet of uncovered steel piping carrying steam at 50 lb. pressure, the loss through a 1-in. pipe is over 16 tons of coal a year; through a 3-in. pipe over 42 tons; and through a 6-in. pipe over 80 tons. At 100 lb. pressure, losses are 20 tons, 54 tons, and 103 tons. At 150 lb. pressure, losses are 24 tons, 64 tons, and 121 tons. The figures are based on coal having 12,000 BTU/lb.; on a boiler with over-all efficiency of 60 per cent. and working 24 hours/day, 365 days/year.

With coal at, say, £2 a ton, such losses are running away with a tidy sum of money. But worse still is the fact that the losses are eating into your coal stocks, and there is that much less to do useful work. Moreover, you may be robbing a factory which needs every scrap of coal it can get for vital munitions.

To make sure of your fuel supply going as far as possible, keep your eyes open all the time for heat losses, no matter how small they may be.

Among the first things to look for are those odd lengths of uncovered steam piping that nobody has ever bothered about. Lag them. And if you see any loose or broken insulation, put that right, too. It's always worth while.

EXPERT ADVICE

Expert advice and assistance on the proper insulation of steam lines and steam-heated equipment can be had through the Mines Department. Specialist help in many other ways of making substantial economies in fuel consumption is freely offered to you.

Will you please make use of the enquiry form below and send it to the Mines Department in London.

Placed at the disposal of the Mines Department by Spirax Manufacturing Co., Ltd., Cheltenham, Glos., as a contribution to the national campaign for greater fuel economy.

To the MINES DEPARTMENT, Fuel Efficiency Committee,
Dean Stanley Street, Millbank, London, S.W.1.

ENQUIRY FORM

Please supply without charge full information and advice on the following subjects, marked with a tick:

.....Improved boiler plant efficiency.
.....Correct methods of condensate and air removal from steam-heated plant.
.....Insulation of steam pipes.
.....How to make the best use of condensate.

NAME AND
ADDRESS

A.442

Visible Fluids
PYREX GLASS PIPE LINES
REGD. TRADE MARK. BRAND
are transparent, heat-proof, acid-proof
The great advantage gained by the use of a Pyrex brand Glass Pipe Line is that of transparency, which permits a visual check on colour, clarity, and rate of flow of the liquids carried, while any crystallization or sediment can be immediately detected.
Low thermal co-efficient of expansion (·0000032) permits flushing and sterilizing with steam, hot water, and even hot-acid solutions. Ample mechanical strength for pressures up to 50 lbs. per square inch. Advice, layouts, and quotations gladly supplied.
JAMES A. JOBLING & CO. LTD., SUNDERLAND.

Casting Your Breadfruit on the Waters—

WHEN the mutineers threw the breadfruit overboard, they brought a dubious experiment to an end, and if their just return came upon them 'after many days', they could hardly in justice complain about the nature of the increment.

Without going deeply into the purpose of their botanical industry, we might well wonder why their curious minds failed to tackle other and more urgent experiments. The preservation of food and water in a fit condition for human consumption might have engaged their attention with considerably more profit, and among its many benefits would have been that of peace and quiet on the 'Bounty'.

To-day, if we can look with pride on our achievements in this direction, the gain has been due, not to greed and inhumanity, but to years of patient experiment in cleaning and sterilising, washing and filtering—and their resulting train of benefits to mankind, 'after many days'.

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Today the business is pre-eminent in its field; it having been built up by supplying the highest quality goods at reasonable prices.

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Large Mills and Factories are established in LONDON, LIVERPOOL, BELFAST, TANDRAGEE and REIGATE.

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Of topical interest to

TIN PRINTERS, OPEN TOP CAN MANUFACTURERS AND FOOD PACKERS

HERE is a list of the principal Varnishes and Lacquers used at the present time by the Tin Printing and Canning Industry, and manufactured by Robt. Ingham Clark & Co. in association with R. Gay & Co.

FOR TINPLATE PRINTERS

Pasteurising Stoving Varnish (Deodorised),
White Dial Stoving Varnish, Silver Stoving Varnish,
Pale Elastic Stoving Varnish, Tinplate Stoving Varnish,
Non-poisonous Gold Stoving Varnish,
Gold Stoving Varnish (Self coloured),
Retorting and Acid Resisting Gold Stoving Varnish,
Coating Sizes for Coloured Stoving Enamels,
Stoving Coating Enamels in agreed shades.
Black Stove Enamels (Dull and Glossy),
Translucent Coloured Stoving Lacquers in agreed shades.

FOR OPEN TOP CAN MANUFACTURERS

ORCHALINE. An anti-acid Lacquer for the insides of Fruit Cans.
ANTISULVA. A sulphur-resisting Lacquer for the insides of Vegetable Cans.
HAM LACQUER. For internal coating of Ham Tins.

TENTEN LACQUER—FOR BLACK IRON PLATES

This double-sided Lacquer is an outstanding rust-preventative. It is non-poisonous, Acid Resisting and Odourless.

All the above specially made for Stoving in Automatic or Box Stoves.

FOR FOOD PACKERS

AIR DRYING GOLD LACQUER & AIR DRYING BLUE LACQUER

Both the above supplied in all shades for the exterior of Food Cans.

ROBT INGHAM CLARK & Co. and R. GAY & Co., Witley Court, Witley, Surrey.

Telephone: WORMLEY 280-4

LONDON OFFICE: 6 ARLINGTON STREET, S.W.1 (TELEPHONE: REGENT 0881)

If you are engaged also on Munitions and Armaments work, write for a copy of our "WAR SUPPLIES CATALOGUE," it contains valuable data for buyers and users of Paints, Varnishes, Lacquers, etc., to specification.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED

SALES OFFICES AT:

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True FLAVOURS

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STAFFORD ALLEN & SONS LTD
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Science leaves no mice to tell the tale

There is only one sure way of combating the growing menace of mice throughout the country—you must enlist the aid of science.

The outstanding country-wide success which the British Ratin Company has achieved in the elimination of rats can be equally well applied in the case of mice infestation.

The scientific methods employed by the skilled operatives of the British Ratin Company are harmless to domestic animals and birds; but successfully eliminate the menace of rats and mice.

The British Ratin Company has no preparation for sale to the general public; it offers a service only.

Fill in the coupon and the Ratin Company's local surveyor will call and give you an estimate for dealing with your infestation.

The Ratin Service is available anywhere in Great Britain and Ireland.

The Service also deals effectively with beetles, cockroaches, and other insect pests.

RATIN SERVICE

First ALLAYS Suspicion - then DESTROYS Rats

To THE BRITISH RATIN CO., LTD., 58, Kingsway Corner Buildings, London, W.C.2
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Please ask your Surveyor to call and explain how the Ratin Service (preparation not supplied) deals with rats, mice and insect pests.

Name.....

Address.....

Date of appointment..... *Time* .....

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BY USING

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A lining of Tetleys enamel will help enormously in this direction. In addition, sterility, safety and purity are ensured. Scientifically prepared for your needs it is easy to apply and is effective for many years. It is especially suitable for application to American OAK.
FREE literature sent or demonstration given entirely without obligation. Write to-day.

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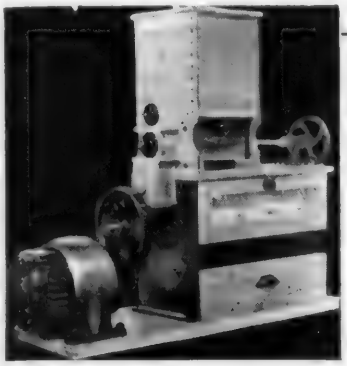
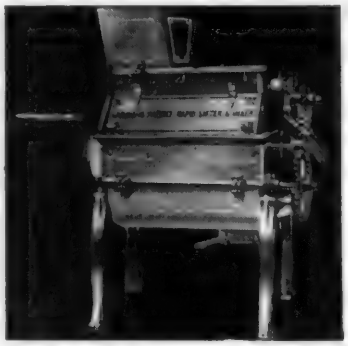
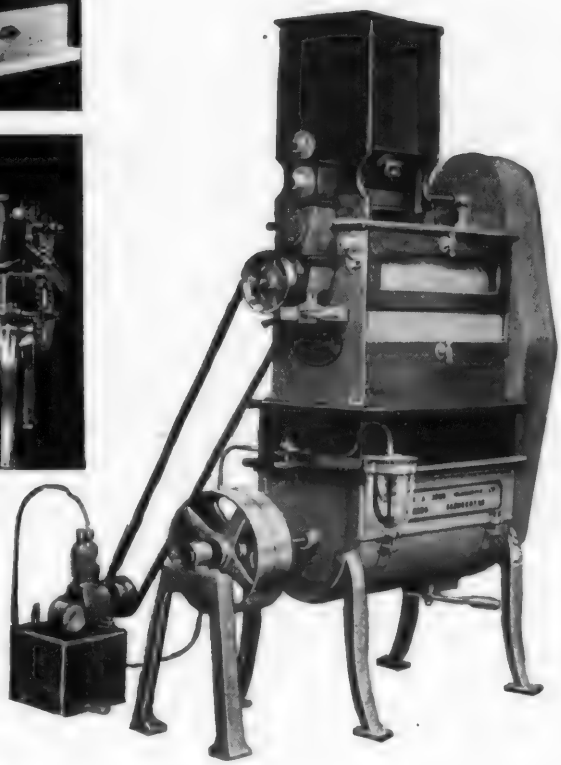
Please send for the free booklet "Contamination 0°," showing untouched photographs of Tetley's enamel in use.

THESE WORKMEN PAY THEIR OWN WAGES







This Gardner combined patent Fine Powder Dresser, "Rapid" Mixer and patented Sprayer (illustrated on right) embodies new type air compressor and spray which gives results far surpassing anything previously achieved. Full information about any Gardner machine will be sent on request.

Many customers have told us that Gardner Patent "Rapid" Sifters and Mixers and Powder Dressers soon pay for themselves.

The machines we illustrate will enable you to produce any powdered foodstuff, blended to perfection and free from all oversize particles, grits, lumps, fibre and similar impurities. The products of these machines will be powders of the finest texture, equalling in perfection of mixing, uniformity of colour, flavour or aroma, the best known products of their kind.

All are easily cleaned and may be used to make many widely different products in quick succession.

Write for full particulars NOW

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Showing an Albro 16-head vacuum-operated filler for Worcester Sauce; constructed throughout in bright polished Stainless Steel.

Output 400 doz. per hour.

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Behind the line of battle, the vast army of workers on the Industrial Front are called upon to play no less vital a part in the National Effort than the armed forces themselves. No one doubts that upon their activities in mine, factory and workshop, and upon their capacity to secure the utmost from Britain's industrial resources, depends the hope that Victory will be ours, and ours soon. Lamberts are proud in their own sphere to share in that effort. With staff reduced and under conditions of restriction, they yet maintain the high standard of their product and of their service, ready when the time comes to resume their established part in peace-time production and progress.

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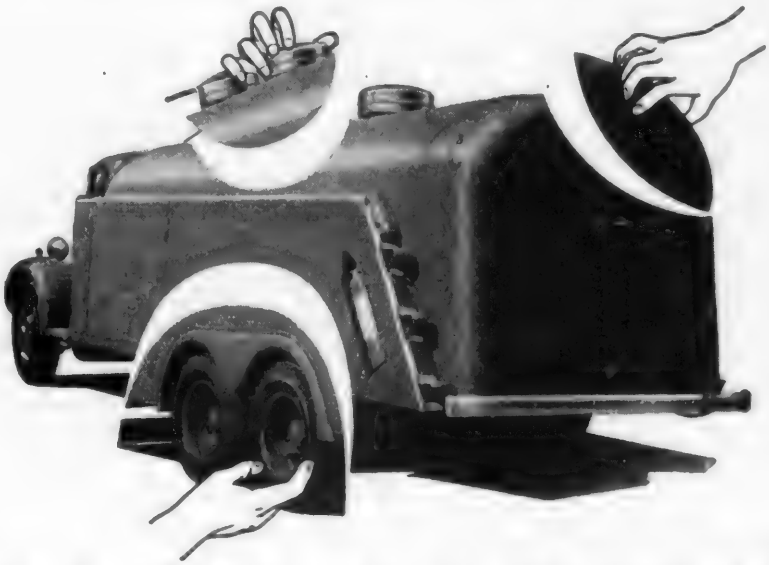

ALL PART OF A PATTERN

THE WHOLE OF INDUSTRY is transformed into a pattern with a single purpose. Naturally Road Tanks are affected, for the Mild Steel, Stainless Steel and Aluminium from which Butterfields used to fabricate large numbers of Road Transport Tanks are now essential to that pattern, so the kind of delivery which our many friends in the Food Industry associate with the Butterfield name cannot again apply until easier times return.

Butterfields OF SHIPLEY
Builders of Tanks for 50 Years
FLORUIMUS · FLOREMUS · FLOREBIMUS

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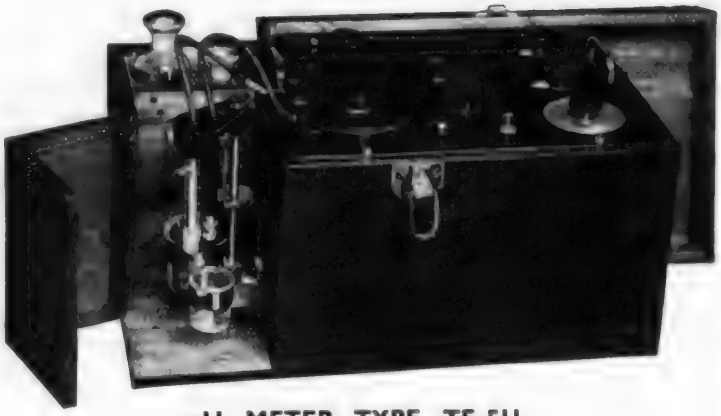
BRANCHES: Belfast, Birmingham, Cardiff, Dublin, Glasgow, Liverpool, London, Manchester, Newcastle-upon-Tyne, Nottingham.

Road Tanks

The Battery Operated pH Meter Type TF.511 here illustrated has been designed for the laboratory or works where mains supplies are not usually available, or where the number of tests taken do not warrant the installation of our mains operated models. This instrument is ideal for the mobile laboratory where speedy and accurate results are essential. The range is 0-14 pH and accuracy 0·02 pH. Completely self-contained with Dip Type class Electrode System. Long life batteries and absolute stability.



pH METER TYPE TF.511

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THE WAY

"ATLAS" SIFTERS AND MIXERS

"Atlas" Sifters and Mixers will economise labour, give the highest possible yield and enable you to make the most perfect blend in a very short time. Made in our Leeds works by men who have a lengthy experience in the design and construction of Mixers, "Atlas" Sifters and Mixers are good for a lifetime's work.

The Porteus way is the satisfactory way, because Porteus know, from long association with mixing problems, just what is required.

Send for Catalogues and, better still, ask Porteus for advice and help.

No. 1497
Size 4 Machine with gear and chain cases removed—can be supplied belt driven or direct motor driven.

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No. 7a size Patent "Atlas" Sifter and Mixer direct coupled to Electric Motor through Double Spur Reduction Gear and fitted with Twin Sifters.

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LEEDS BRIDGE WORKS *Provender Milling Specialists* LEEDS 10

RB F.1

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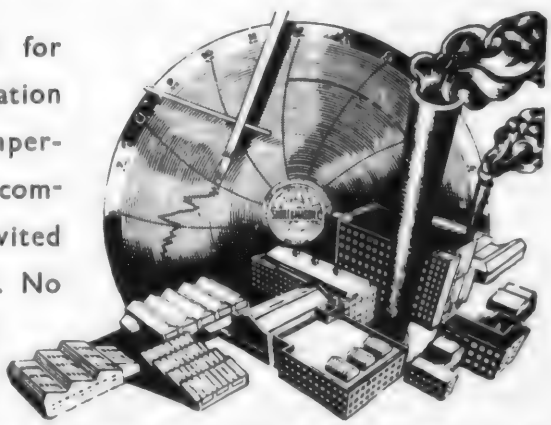
Manufacturers whose operations call for continuous accuracy of Record, Indication or Control, whether of Pressure, Temperature, Time, Humidity, Level or Flow, or combinations of any or all of them, are invited to consult Short & Mason's Engineers. No obligation is entailed in a preliminary survey.



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Purity of Food Products is always a first consideration, and it is obvious that the Rubber Ring used to seal the Food container must not contaminate the product in any way.

Whilst every economy must be effected in the use of raw rubber, our technical staff are busy daily to ensure the highest possible purity in the ingredients used in the manufacture of guaranteed quality Poppe Rubber Rings for all Food Closures.

POPPE RUBBER RINGS — PROTECT PURITY!

THE POPPE RUBBER & TYRE COMPANY LIMITED

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Telephone: POPESGROVE 2271 (3 lines). Telegrams: POPPE, TWICKENHAM

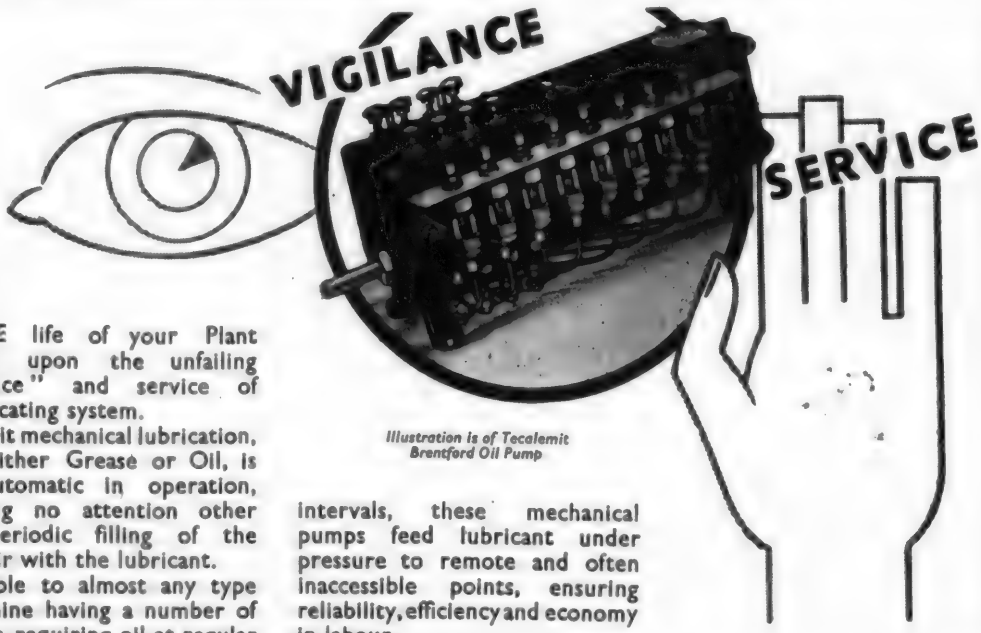

Illustration is of Tecalemit Brentford Oil Pump

THE life of your Plant depends upon the unfailing "vigilance" and service of its lubricating system.
Tecalemit mechanical lubrication, using either Grease or Oil, is fully automatic in operation, requiring no attention other than periodic filling of the reservoir with the lubricant.
Applicable to almost any type of machine having a number of bearings requiring oil at regular intervals, these mechanical pumps feed lubricant under pressure to remote and often inaccessible points, ensuring reliability, efficiency and economy in labour.

MECHANICAL LUBRICATION *by* TECALEMIT

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WITHOUT CORRECT LIGHTING IN THE FACTORIES THAT SUPPLY THE SERVICES, OUTPUT MUST SUFFER.

Good lighting, so closely allied to production and the welfare of workers is vital. If your installation needs better planning—or changes are required here and there to take care of new processes—or extensions are necessary—consult the G.E.C. Take advantage of the knowledge G.E.C. lighting specialists have gained in helping wartime factories towards full production.

Consult the G.E.C.

FOR ANY STANDARD OF ILLUMINATION

WITH

Osram Lamps and **Osram** Fluorescent Tubes

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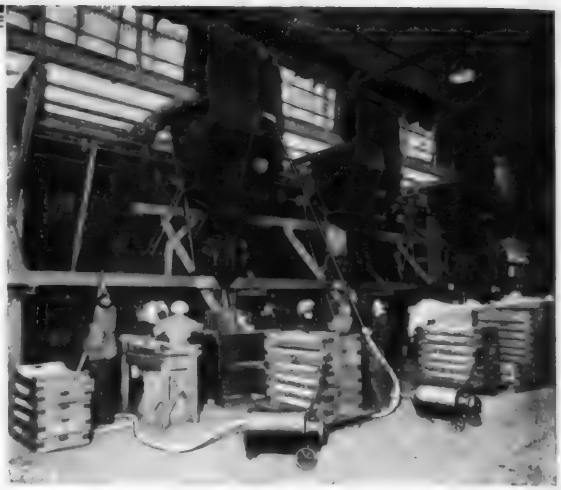
I.E.4

The Clean Way to Clean in Food Factories

STURTEVANT INDUSTRIAL VACUUM CLEANERS



The experience of many tea, baking powder, custard powder, milk powder, chocolate, cocoa, biscuit, jam salt and other food factories has shown that the systematic and regular use of a Sturtevant Cleaner will overcome dust problems, effect a reduction in maintenance costs, increase the efficiency of all cleaning operations and, as a result of the very clean conditions obtainable, better goods and greater output can be produced.

Our post-free publication W1391 gives full details of Sturtevant Industrial Vacuum Cleaners.

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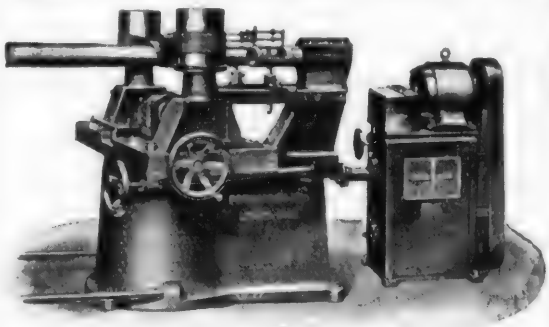

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WINDING MACHINE
has no equal for Strawboard Tubes 1" to 10" diameter.

SEMI-AUTO SEAMERS
for seaming lids on Composite or Tin Containers 1½" to 6" diam., 1½" to 24" high. Controlled output from 25 to 40 per minute.

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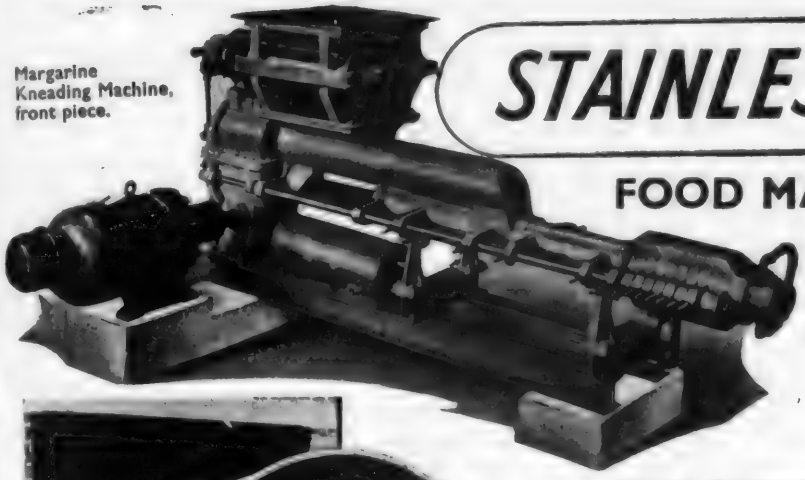
FOOD MANUFACTURING EQUIPMENT



Margarine Kneading Machine, front piece.

The various types of Food Plant Equipment illustrated are but a few of the things we are making to help not only Food Manufacturers but also the NATIONAL EFFORT.

■ ■ ■

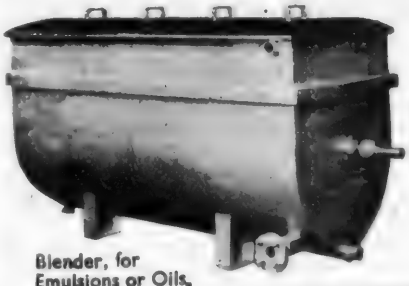
Modern Equipment requiring less operatives and releasing skilled maintenance workers for other types of Tanks—should be the order of the day.

■ ■ ■

Our technical staff can solve YOUR problems as they have done other special ones connected with more serious matters—which you wouldn't want to know, or if you did—we couldn't tell you.

Storage Tank, nearing completion.

Extruding or Packing Machine for Margarine or Butter.



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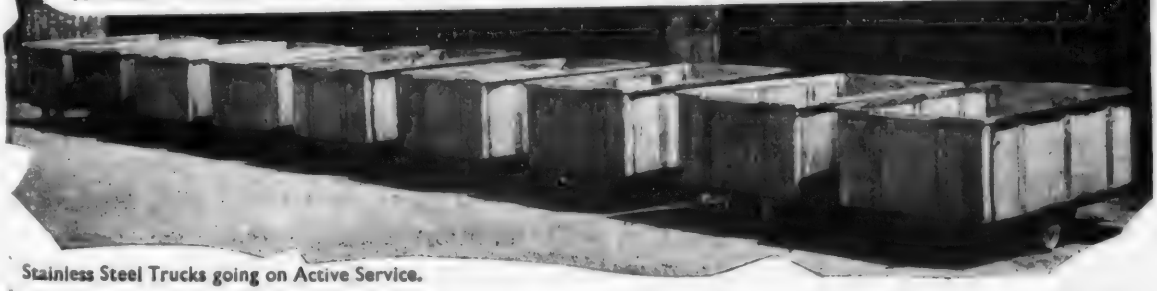

Stainless Steel Trucks going on Active Service.

FOOD PLANT & PROCESSES

Designed and Manufactured by Specialists

EVAPORATORS

FOR CONCENTRATING MILK, GELATINE, PECTIN, SYRUPS, FRUIT JUICES AND HEAT-SENSITIVE LIQUIDS

SPRAY DRIERS

FOR THE PRODUCTION OF POWDERED MILK, GELATINE, PECTIN AND ALL LIQUID FOOD PRODUCTS

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FOR FISH, FISH CAKES AND OTHER FRIED FOODS

ALSO

KESTNER PATENT PROCESS FOR CONCENTRATING FRUIT JUICES WITH FULL RETENTION OF FLAVOUR

KESTNER PATENT PROCESSES FOR PRODUCTION OF DRIED FRUIT AND VEGETABLE POWDERS OF EXCEPTIONAL QUALITY

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Made in large variety of shapes and sizes.
Indents through Merchants and Shippers.

MAKERS ALSO OF FLAN AND TART TRAYS,

Waxed Jelly Cases, Cake Frillings, Plate Papers, etc., for Wholesale and Retail Bakers and Confectioners.

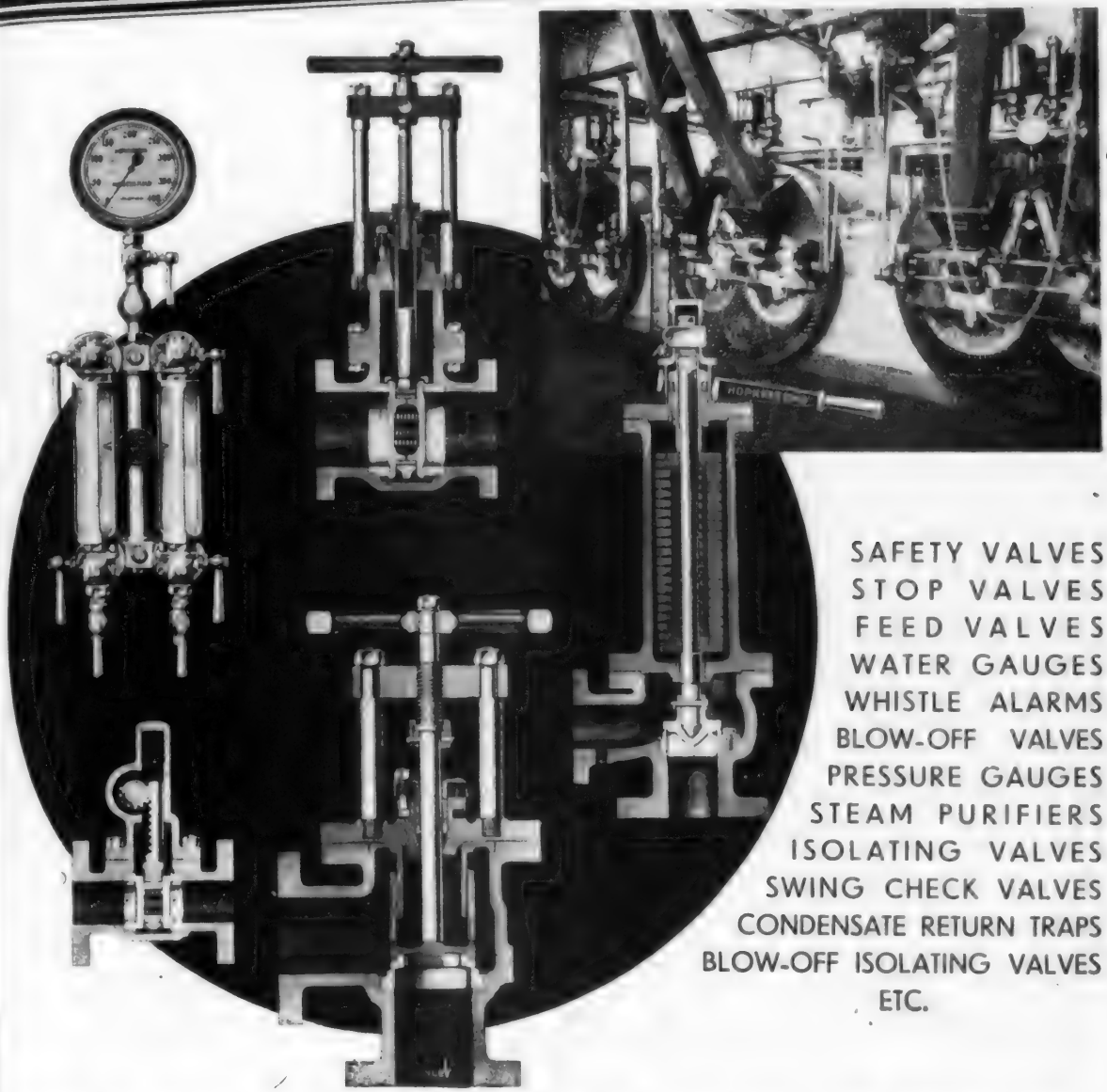
CHEVERTON & LAIDLER,

Manufacturers of Paper Food Containers,

Chevler Road, Princes Risboro', England.

Keen Agents with Bakery connections (export) wanted. Send fullest particulars and British references.

MOUNTINGS *for all*
"SHELL" TYPE BOILERS



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TEAK

FOR VATS AND TANKS

The prime requisites of a modern vat or tank are that it shall last and that its planks shall not swell with wetting nor shrink with drying.

Teak lasts. It is not claimed that Teak is indestructible, even though its durability under most adverse circumstances is astonishing, but it is well attested that those factors which break down timber take longer to affect Teak.

Teak does not swell and shrink as much as other timbers. This again is well attested, and so vats and tanks are better made when made of Teak. And because Teak lasts, Teak is cheaper.

Wooden settling, pickling, brine and storage tanks; mixing, boiling and pressure vats, are better made from Teak.

Teak is Tectona grandis. Other timbers, miscalled Teak, are not Tectona grandis and have not the properties of true Teak. Burma Teak is true Teak.

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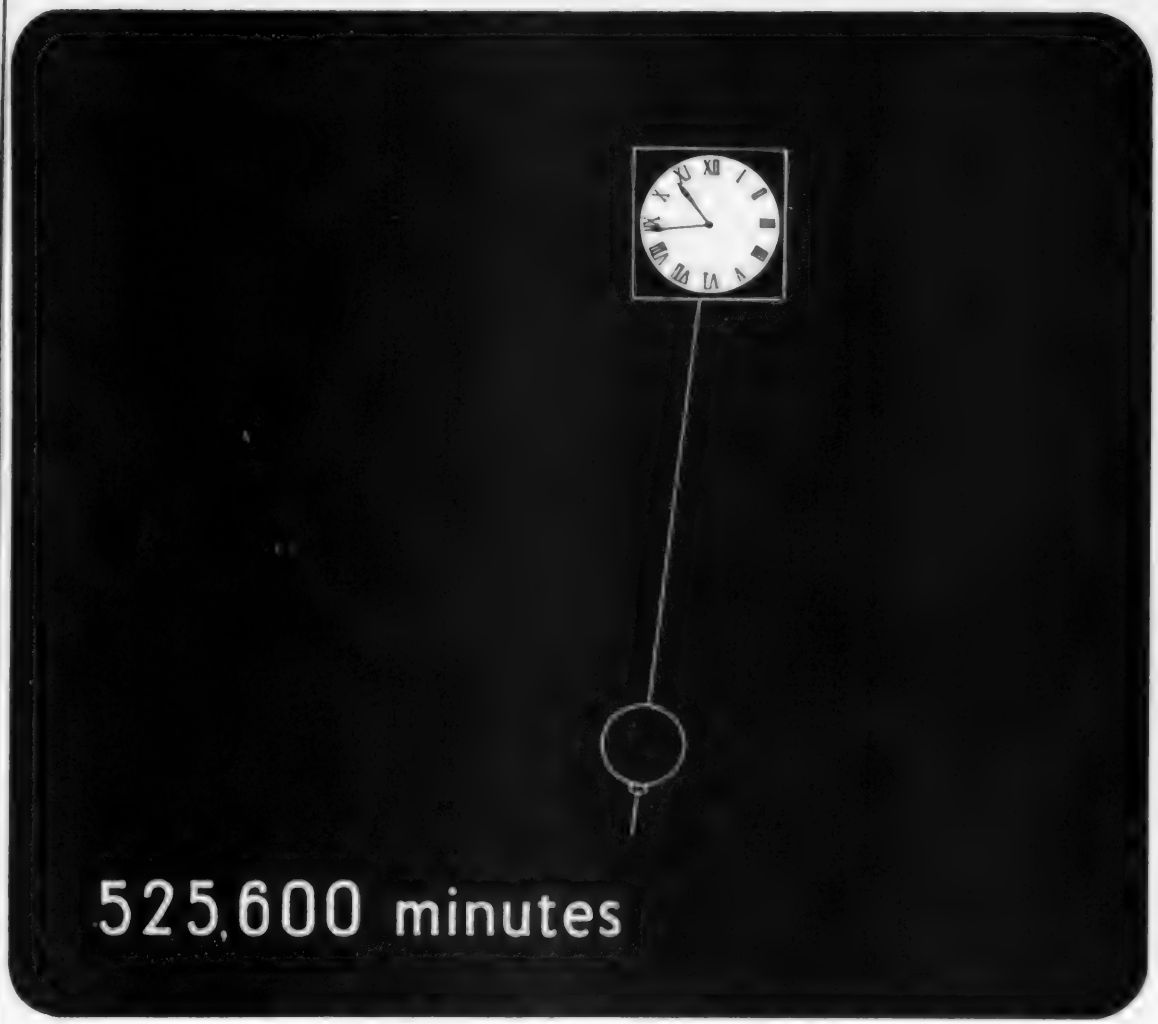

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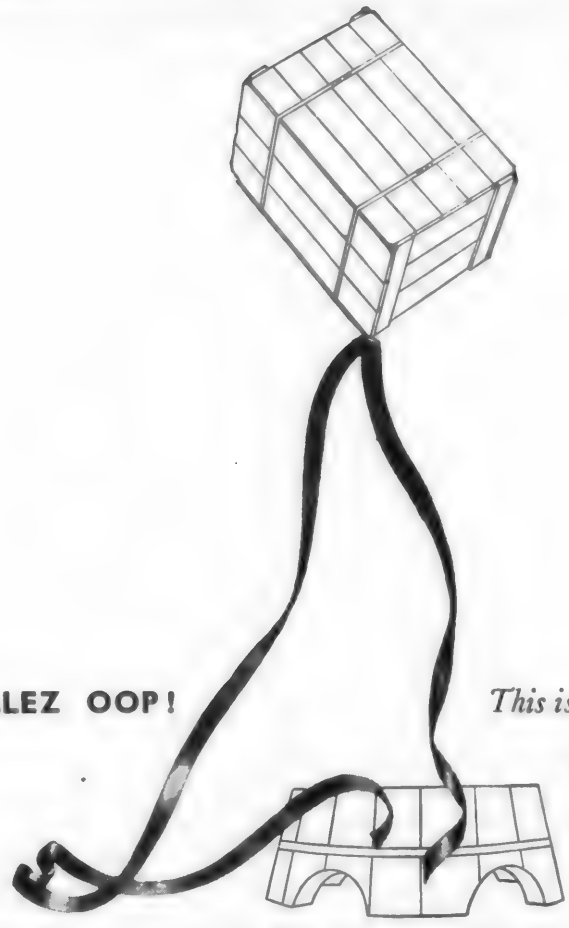

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FOOD MANUFACTURE

Vol. XVII. · Published Monthly · April, 1942

CONTENTS

Contents

Editorial - - - - - - - 81

The War-time Boiler House. *H. C. Appleby* - - - - - - 84

Fuel and Power—*A Symposium* - - 89

A Scientist looks at Food Control. *Hugh Nicol, M.Sc., Ph.D.(Lond.)* - 94

The Contamination of Foods by Poison Gases. *W. R. Wooldridge, Ph.D., M.Sc., M.R.C.V.S.* - - - - 96

Bacteriology and Food Preserving. Part II. *J. G. Baumgartner* - 101

Prevention of Fruit Abscission - 102

The Enrichment of Flour. *An American Summary* - - - - - - 103

Has the Great Eel Experiment Failed? 104

Fruit and Vegetable Protection - 105

Ministry of Food: Latest Statutory Rules and Orders - - - 106

News from the Industry - - - 107

Information and Advice - - - 111

Recent Patents, Trade Marks, and New Companies - - - - - 112

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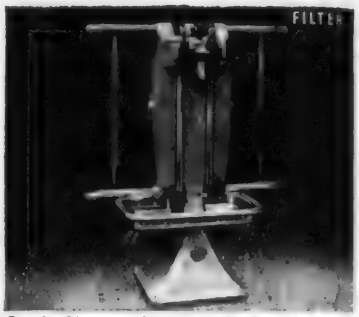

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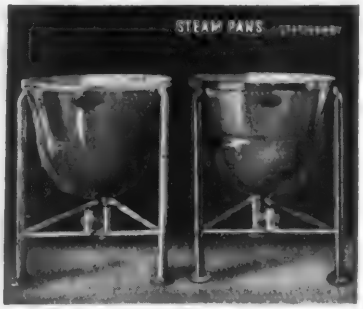

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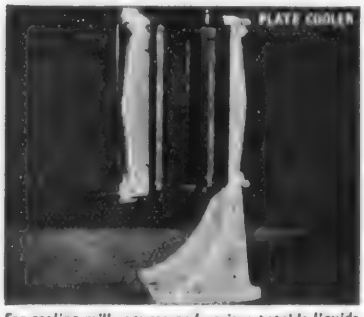

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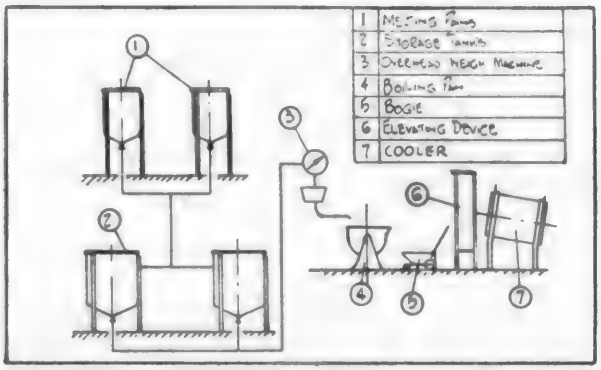

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FOOD MANUFACTURE

Vol. XVII, No. 4 April 1, 1942

Egg Substitutes

PROSECUTIONS in connection with egg substitutes still go on, with their farcical accompaniments, the conversion of the courts into miniature confectioners' shops and the strenuous efforts of those concerned to "pass the buck" on warranty. Analysts whisk eggs and egg substitutes before the bench (despite the fact that they have been told in other courts that they must not comment on their certificates); cookery "experts" confuse the issue with their diametrically opposed opinions. Magistrates, according to their temerity, taste or do not taste cakes, custards and other confections. Medical officers of health gravely discuss egg proteins, vitamins and minerals, although the amount of these substances in a small slice of cake is neither here nor there.

Most of the litigants rely on the good old proverb "the proof of the pudding is in the eating", but if a mixture of anything up to 98 per cent. flour, a little soya flour, dye, baking powder and gummy matter can help to make a good cake, why bother about eggs or egg substitutes?

According to one authority, the effects produced by eggs in cakes are due to their ability to make gluten more plastic and elastic, to incorporate air and to set the resultant foam by coagulating during the baking process. None of the egg substitutes whose composition has been divulged will do that. Why not have done with all this pother which is wasting the valuable time of busy people? From the eulogies bestowed upon cakes made with the aforementioned mixture it seems that Mrs. Beeton was off the track with her "take a dozen eggs".

Pleading v. Compulsion

The attempts to induce, by moral suasion, the populace to eat national wheatmeal bread have been a dismal failure and now other methods have been adopted.

From the Government point of view it has been "pull devil, pull baker", which, being interpreted, means feeding stuffs *v.* shipping space. The balance has now tipped in favour of the latter. Although in the national interests the actual amount of shipping which will be saved annually cannot be disclosed by the Government, it will doubtless be significant.

Following the decision of the Government, three orders have been made by the Minister of Food: (1) An Order further amending the Flour (Control and Prices) Order, 1941; (2) an Order amending the Bread (Control and Maximum Prices) Order, 1941; and (3) the Flour (Restriction on Use) Order, 1942.

The effect of these Orders is that from March 23 no more white flour has been produced, except under licence. For the purpose of using up stocks of white flour, sales will be allowed until April 6 to licensed bakers, provided that three times the quantity of national wheatmeal is delivered at the same time. From April 6, the only bread on sale will be national wheatmeal or other authorised brown breads, and from April 20 the manufacture of any food will be prohibited unless at least three-quarters of the flour contained in it is of not less than 85 per cent. extraction.

This change in the dietary habits of some 93 per cent. of the population with respect to one of the most important articles of food offers a great opportunity to the dietitians, who will gain practical instead of theoretical knowledge of the effects of brown bread.

The Silver Lining

The daily press has taken time by the forelock in announcing the passing of the tinplate can and the appearance of its blackplate substitute as a container for processed foods. A weekly contemporary also says that "the canner, instead of spraying on tin, now sprays on silver, and the can, like the cloud, is given a silver lining".

The actual facts seem to be that blackplate has been used for cans containing food products not needing processing, such as Lyle's Golden Syrup; that although intensive investigation is being made with a view to the employment of blackplate for processed cans, and interesting developments may be expected in the near future, the problem has not yet been completely solved.

With regard to the use of silver, this is having some attention, especially in the United States. Incidentally, an interesting example of the use of

silver lacquer to replace chromium plate has recently been reported, a cycle firm having used it for this purpose. The "silver" lacquer is applied with a spray gun, stoved at medium high temperature, and followed by a coat of synthetic clear medium which is stoved at medium temperature. For various reasons this method is not applicable to cans. However, the best brains of the industry have been occupied on the problem for some time. As far back as 1940 some experiments (*J.S.C.I.*, 1940, p. 259) by R. Kerr were reported on the production of a protective oxide film on blackplate, which would enable meat to be canned without the danger of staining or corrosion.

Tin Supply Position

The tin position does not appear to be so serious for the moment as was anticipated, although this does not mean that the need for economy must be ignored.

From authoritative estimates by the Tin Producers' Association, assuming that no further supplies are received from the Dutch East Indies, and stocks in the United Kingdom ignored, there should be no real shortage of tin for essential purposes for four years. The remaining sources should supply some 90,000 tons per annum, of which Bolivia would contribute 45,000 tons, the Belgian Congo 19,000 tons, and Nigeria 15,000 tons.

This estimated production necessarily depends on the assumption that the producers will have every facility for the maintenance of output on a high level. So far as consumption is concerned, the total can be brought down from the 1941 figure of 175,000 tons to 125,000 tons as a result of the exclusion of all unessential demands. In normal times, approximately half the tin consumption of both the United Kingdom and the United States is absorbed by the tinplate industry, and the largest use for tinplate is in the manufacture of tin boxes. The proportion of this for processed food containers is approximately two-thirds, the remaining one-third being used for the manufacture of boxes for dry unprocessed foods and goods other than foods.

On a supply basis of 125,000 tons, the United States would consume 75,000 tons, the United Kingdom 25,000 tons, Russia 15,000 tons, and other Allied countries 10,000 tons.

Taking into account these estimates of production and consumption, the draft on stocks should not be more than 35,000 tons a year, whereas the United States alone has some 150,000 tons in stock. It is emphasised that while every effort must be made in the United Kingdom to economise tin the brunt of the adjustment must necessarily be borne by the United States.

The favourable position as regards supplies is due to the forethought of the International Tin Committee, the United States Government, and the tin-mining concerns, particularly in Nigeria, without whose preparatory achievements it would have been impossible to raise production sufficiently to enable a strategic reserve of such immense proportions to be accumulated, states *Tin*.

Concentration of the Sweet Industry

The advisability of concentrating the chocolate and confectionery industry has recently occupied the minds of many people representing various interests in the trade.

While agreeing that there is a very strong case for the introduction of such a measure, we understand that the problem is already being faced by internal concentration of the firms, as individuals, which probably eliminates the necessity for squeezing out the smaller manufacturer, a process which would introduce many additional problems.

Each chocolate and confectionery manufacturer has been forced to make drastic alterations in his production schedule. These changes have been brought about as a result of several factors, the chief of which are the very great shortage of packing materials, the scarcity of ingredients, the lack of labour and the introduction of price control. The action by the Ministry of Food in compelling production executives to eliminate luxury lines and to concentrate on production mainly in the two lower categories, has automatically introduced mass production, and only by this means can the industry obtain a reasonable profit on the prices permitted.

In all probability the decrease in output consequent upon the rationing of essential raw materials has been more than offset by the scarcity of labour, but each individual unit has been able to make adjustments which have increased the quantity of chocolate manufactured per worker. This has been achieved by increasing the production of moulded goods, while judiciously pruning the lines involving chocolate assortments.

The question to be decided at this stage appears to be whether there are any factories which could undertake additional output with the limited labour at their disposal. At the present time there are very few in this position.

If concentration of industry is to be applied by means of legislation, forcing the smaller units to cease manufacture so that all the available raw materials may be transferred to the larger units, several overwhelming problems will be introduced, thereby jeopardising the sales prospects in other areas in post-war years. It is doubtful, however, whether such an objection would be valid if a total war effort is to be achieved.

Further, this form of concentration would not only mean pooling raw materials which are sufficiently uniform to produce a standard chocolate, but it would also call for the centralisation of

equipment, such as moulds. Here is something which is not at all standard. Various shapes and sizes require different temperatures and times for moulding. The efficiency of a moulding department depends on a complete and absolute knowledge of the conditions which must be maintained, in order to obtain the best results from the type of mould which is employed. Problems such as this might slow down the momentum of production, and achieve no greater efficiency than if the industry were left as it stands today.

Hygiene in the Food Industry

The medical press has given considerable prominence to recent outbreaks of paratyphoid fever in the suburban areas of Birmingham, Bristol and Liverpool. A leading article in *The Lancet* (February 7, 1942) summarises the results of the investigations made in connection with these outbreaks, and emphasises the dangers of the contamination of synthetic cream. The chance of foodstuffs being contaminated by human carriers of an intestinal pathogen is greatest if the disease is of a kind which includes among its victims a proportion of mild infections and transient carriers who continue at work while excreting the organism. Paratyphoid is now such an infection. As to means of control, the Widal test is not now regarded as wholly reliable, for transient carriers may not show any specific antibodies in the blood. But it may be a useful preliminary examination in tracking infected persons among a large staff of workers.

With regard to precautions by food manufacturers, the new Food and Drugs Act which came into force in 1939 made the epoch-making order that any business concerned in the handling of food requires the installation of wash-hand basins, towels and soap in all such premises. In a letter in a subsequent issue of *The Lancet*, Dr. Maitland Radford stresses the importance of the position of these washing facilities—that they should be as near as possible to the w.c. accommodation. We would like to add that that potent instrument of infection, the roller towel, should be eliminated from all food factories.

The Future of Scientific Research

Although concerned primarily with medical research, the points raised in an article by W. W. Walther (*The Lancet*, December 27, 1941) apply equally well to any other branch of scientific research.

In spite of the enormous value of research which is published, little of it finds its way into general use, partly because much of it remains unverified and partly because it is simply not noticed. There is no dearth of subjects but there is a lack of an organisation which can apportion the work to the best advantage. The writer criticises modern research under three heads—inadequate endowment, lack of organisation and a failure to get results embodied in practice in a reasonable space of time. For the organisation of research a responsible controlling body would have to be set up in the form of a central bureau which abstracts all that is known on particular subjects in any language, so that the researcher is saved the labour of reading a vast amount of literature in order perhaps to clear up one small point.

The writer demands facilities for such an organisation (albeit paid for from the public purse), for preventing the investigator from engaging in redundant work and for providing him with adequate abstracts of all that is known about his chosen subject. The magnitude of such a scheme in connection with food research might be visualised by considering such a subject as the vitamins or even the arguments pro and con wholemeal bread. Perhaps one day, when money is no longer needed for destructive activities, a scheme of card-indexing all knowledge—such as is described by H. G. Wells in his "Shape of Things to Come"—may be realised.

Make a Song About It

In the cheery times of the nineteenth century they used to make music-hall songs about current events—the penny post in 1841, the new gas, electricity and so on—and doubtless these songs disseminated information to the man-in-the-street. The B.B.C. valiantly tries to educate him by means of talks by learned exponents on their subjects, and even tried recently to make one unfortunate visiting expert of the Brains Trust explain the whole subject of vitamins in three and a half minutes.

But even with past examples to guide them, those of the B.B.C. responsible for the general enlightenment of the people have never resorted to the song. We listen to dolefully-howled saccharine effusions to Dolores (which appropriately enough is the Spanish equivalent for pains), and other almost unbelievably inane laments or invocations to the particular representative of Aphrodite who is in vogue, and wonder whether there is not a vehicle here for a little gilding of the pill of salutary instruction. For instance, if the word "vitamin" were slightly modified to "vitameena"—the penultimate syllable accented *con molto expressione*—it might form the subject of a skilfully worded song in which some leading virtues of food factors might be epitomised and popularised, while camouflaged as "swing".

The desks of our office poets being unavoidably vacant for the time being, we offer the suggestion to the lyric writers of the B.B.C.

The Wartime Boiler-house

That the majority of boiler-houses in this country are working at less than 70 per cent. efficiency and that more than 50 per cent. are not working on modern scientific lines is a disturbing opinion, which may not be shared by other combustion engineers. The further contention that as much as 10 per cent. of fuel could be saved in the majority of the cases where Lancashire boilers are being used is followed up by the author with practical suggestions.

H. C. APPLEBY.

AS THE result of the carrying out of some hundreds of boiler- and power-plant efficiency tests during the past thirty years, the author is forced to the conclusion that the majority of the boiler-houses in this country are working at less than 70 per cent. efficiency, particularly those using Lancashire or similar type boilers, and that more than 50 per cent. are not working on modern scientific lines. Indeed, it is safe to remark that in the majority of the latter type a saving of 10 per cent. of the fuel could be secured at a cost which would be easily recovered within twelve months, or even less. This result, if achieved, would release an enormous amount of labour and transport for other purposes, but, when executives will not take the steps to secure the obvious economies to increase their own profits, there appears to be little chance of them devoting a portion of their activities in this direction to satisfy national interests.

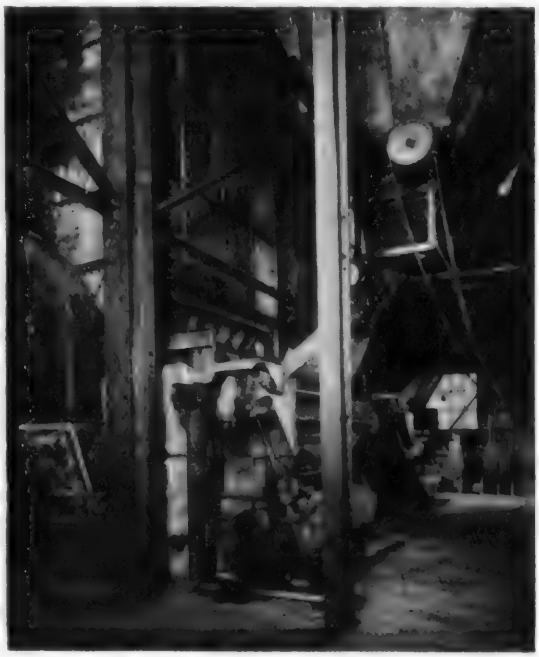
Immediate Economy of Fuel

A conference was recently inaugurated by Mr. D. R. Grenfell, M.P., Secretary for Mines, who asked for the co-operation of technical men with his department in securing an immediate saving of ten million tons of coal per annum. The target aimed at, he said, represented a saving of about 4½ per cent. of the coal won, and coal was at the foundation of the entire war effort. Britain, with its twenty-seven coalfields, is the richest source of crude fuel for its size in the world, and the second largest producer. Within the lifetime of the present generation there has been a very remarkable increase in the efficiency of coal utilisation, but further improvements will be required during the next few months, and these with the use of inferior fuels.

Waste is often due to lack of interest in fuel economy on the part of factory managers, possibly because coal has been too cheap, but a most important point is that few concerns retain fuel experts who are specialists of fuel conservation, as distinct from the usual works engineer. If greater "coal-economy consciousness" were developed among industrial administrators greater use would be made of specialists, and it is as well to point out at this stage that much help can be received by calling in a consultant to instruct the operating staff periodically where it is felt that the whole-time services of an expert would not be justified. Reverting to the desired saving of coal asked for by the Secretary of Mines (that is, 4½ per cent. of the total mined), if successful, this would save 500 million train miles, and would release upwards of 30,000 ten-ton waggons, and would be equivalent to the output of 30,000 men, while the methods introduced to effect these economies would be of permanent value.

Costing Systems

It is quite obvious that if this saving of fuel and labour can be produced, it is up to everybody concerned to exert a big effort to get the desired result. Let us consider an analogy. If, when motoring, the car without any effort on our part, indeed much against our wishes, stops and refuses to give another "rev.", we know something is wrong. As experienced drivers we also know that there is a long list of possible causes of the trouble, and we systematically go through the list, testing at various points until the trouble is actually located. Similarly, most successful manufacturers set up a good costing system to provide details of costs for processing their wares and are thus able, when a daily or weekly return of these detailed costs for processing is put into their hands, to locate quickly any cost that is higher than it should be. Once confirmed, action is taken to eliminate the possibility of a recurrence of that particular fault. Prices are not necessarily based on production costs, but these figures must be known if the concern is to be operated



A View of Boiler with Automatic Stoker.

on a safe margin. Unfortunately, many manufacturers are content, so far as the power plant is concerned, with knowing the *total* cost of coal and labour; fixed charges; and other items of expense; and this they allocate to the finished product. This easy procedure of putting all the power costs in one lump sum does not make provision for allocating the portion which should be charged to each department and to each processing operation. The result is that strict control cost is not possible because variations in unit power service are one of the few readily available measures of manufacturing efficiency.

Power Costing

Power costing, accomplished by the use of meters on all departments and important single operations, as well as periodic tests on all other power service uses are therefore necessary for satisfactory factory operation. Further, it is also necessary to maintain complete cost records in order to control operation of the power plant, because if details of the operating cost of each item of equipment are not known, how will it be possible to correct conditions that are causing unjustifiable expense?

The keen engineer seeks to keep the cost of power services, as represented in the finished products of the factory, at the minimum, and an adequate cost system is a necessity if this is to be done. There should be similar conditions, so far as costing is concerned, applied to the power-house operation as are utilised in the commercial office. In the latter, it is common usage to maintain an adequate system of book-keeping, and to have the books audited periodically, and somewhat similar conditions should apply to power-house costs.

Consideration of the " business " side usually shows that when the cost of raw material, maintenance, standing charges, and labour costs are deducted from the money received by sale of products, the difference is profit. In the power-house (including the boiler-house), if the value of the heat loss, the friction loss, maintenance and standing charges and labour costs are deducted from the value of heat in the fuel supplied, the resultant figures give us the value of the heat utilised. On the business side it is usual to plot graphs showing the rise and fall of sales, and profits, but the majority of factories do not apply the same common-sense methods to their power-house costs and losses.

It is not possible in this article to give a detailed description of the method of costing suitable for all plants, as the design and lay-out of plant in various factories is so variable, yet it is certain that each individual power plant has a point of maximum efficiency, and, in the interest of both the employer and the nation, the plant should be operated as near as possible to that point at *all* times, and, in addition, all should be done that is reasonably possible to locate losses and eliminate their cause as soon as possible.

Importance of Records

This calls for records being made periodically, which will immediately show up any fault. These may be secured by operators taking readings of the necessary indicating or recording instruments. It is necessary to point out that if recording instruments are installed it is not sufficient to look at the 24-hour chart when it is replaced by a new one, as a serious loss may have developed 23 hours previously. To avoid this, one of the operating staff should take a reading from whatever instruments are installed at intervals of not more than one hour, and record them on a suitably designed log sheet. The operator would, of course, report to his foreman (or whoever is designated to receive these reports) when an unusual record is being obtained, when the necessary action could be taken to eliminate a possible loss.

As an instance, supposing that brickwork between the side-flue and under-flue of a Lancashire boiler suffered partial collapse, with the result that hot gases leaving the fire tubes did not fully traverse the surface of the boiler which covers one side-flue and the under-flue, then the temperature of the gases leaving the boiler and being carried off to the chimney would be much higher than they would be if there were no leakage from flue to flue. If these conditions were allowed to last long a serious waste of fuel would be inevitable, as it is possible that the cause of the loss would not be found until the boiler was down for cleaning, probably some weeks later.

Use of Pyrometers

If a pyrometer had been installed just before the damper in each flue, and readings taken each hour, the steady rise of temperature would have shown that serious loss was likely to occur if the appropriate remedy (shutting down the boiler as soon as possible, and, when cool enough for the bricklayer to investigate conditions in the flues, to locate and repair the damage) was not quickly applied. The author has known quite a few cases where the loss has been allowed to accrue to such an extent that it covered the cost of several pyrometers.

The same effect is produced by faulty baffle blocks on the tubes of water-tube boilers. In that case gases would be short-circuiting through the tubes instead of travelling along the whole of their length, and valuable heat units would be discharged at the top of the stack.

Infiltration of Cold Air

Observation of temperatures inside water-tube boiler settings will frequently indicate that cold air is filtering through and bringing down the temperature produced by burning fuel. Incidentally, a useful test that can be employed to ascertain whether the settings of a water-tube boiler has tight brick settings or not is to cover the fire with soft coal, to produce smoke. Then, if the main damper is quickly closed smoke will quickly discharge through the faulty brickwork. This is conveniently done when closing a boiler down. Smoke will be found discharging between clean-cut door flanges and brickwork, through doors that do not close properly, through bad joints of brick setting to boiler headers, drums and shells. The author has had occasion to deal with cases where as much air was filtering into the boiler settings as was passing through the grate and the bed of fuel it carried. When the leaks have been spotted the remedy is to caulk them with asbestos waste, or with mineral wool where it can be applied. Even the bricks themselves deteriorate and become porous, and it is advisable to give the walls a coat of air-tight plastic covering, of which

there are several on the market. All inspection doors should be air-tight when closed and the slots for the dampers, when so arranged that the dampers slide up and down, should be covered on both sides of the damper so that air infiltration is at the minimum.

Air Admission to the Boiler

This question of air admission to the boiler involves not only the reduction of temperature produced by fuel consumption, but also can prevent the complete combustion of gases ejected from the burning fuel. As an instance, the case of a coal, which for perfect combustion requires 11·5 lb. of air per lb. of combustible may be taken. With this class of coal the author has found as much as 35 lb. of air being supplied, which is a surplus of more than 200 per cent. If, under the latter conditions, the temperature of the gases is 600° F. or more, the loss at the chimney will be about 30 per cent. of the combustible. If the excess air is reduced to 17·0 lb. of air per lb. of combustible, the chimney loss with the same flue temperature will be reduced to 15·0 per cent. The result of this adjustment is that the former efficiency has been increased by 15 per cent. (30-15) as based on combustible consumed. Thus, if the efficiency in the first case was 58 per cent., it will now be (58+15) 73 per cent., and we shall be producing $\frac{15}{58}$ more steam for the same fuel, which equals 25·8 more steam for the same quantity of fuel consumed, or we could burn $\frac{15}{58}$ less fuel, equalling 20·5 per cent. less fuel to generate the same amount of steam as before. These figures will demonstrate how important it is to prevent the introduction of excess air into the boiler settings.

Excess Air Through Fire Bed

A similar effect can be produced by permitting excess air through the bed of fire on the grate. There are three main causes of the latter trouble. The first is that when clinkers have formed in the fire and cut off part of the air supply, they usually create holes near the edges through which excess air flows. The cure for this is obvious—keep the fires clean. Ordinarily, when choice of coal is possible, purchase of coal with less ash content, and/or ash with a higher fusing point will reduce this trouble considerably, but unfortunately most people have to take what coal they can get under present-day conditions. It does frequently happen, however, that clinkers attach themselves to the side-walls of furnaces in water-tube boilers, and if these be formed at the front end of a furnace and jut over the surface of the chain-grate, the coal on the grate cannot pass the clinker, where it acts as a closed gate, with the result that the portion of grate behind the clinker is left bare right to the end of the grate, and cold air, uncontrolled, streams into the furnace. When this condition exists the remedy is to take a slice-bar, open up the gate at the furnace entrance at the first suitable opportunity, and slice the clinker off the side-wall, close the front gate of the furnace and resume operations.

Excessive Draught

A second cause is the use of too much draught. In this case, whether using natural or forced draught, the remedy is slowly to close down the damper at the back of the boiler until such draught conditions exist that the boiler load can be carried comfortably. Where mechanical draught is used, the same effect can be produced by regulating the speed of the fan to give the pressure required to supply the required amount of air, then adjusting the damper at the back of the boiler, reducing the natural draught to a point which leaves a slight vacuum in the furnace.

The third cause is too much air entering through the fire-bed. This may be due to holes in the bed of the fire, or a fire which is too thin in parts. In these days, when choice of coal is not always possible, every effort should be made to avoid being saddled with a mixture of large coals and " fines ", as this will almost certainly produce an uneven fire with holes. If a mixture of this kind has to be accepted, the lumpy coal should be broken until it will at least pass a 2½-in. mesh before going into the furnace. It is not advisable to run too thin a fire, which is most likely to develop holes or thin spots.

Boiler Control Instruments

Further study of air admission into boilers brings us to consideration of means of securing just the correct amount of air to ensure maximum boiler efficiency. This leads to the introduction of Orsat apparatus, draught gauges, CO_2 recorders, etc., but these have been considered in detail in previous issues of this journal, to which reference should be made. To factory engineers where Lancashire boilers are used, frequent reference should be made to the diagrams which were issued as a supplement to FOOD MANUFACTURE for April, 1939, which deals with all the causes of losses at that type of boiler. It has not been possible to issue a similar chart since that date to deal with the modern water-tube boiler, but practical experience has shown that the numerous points referred to below are of major importance to those who have modern water-tube boilers under their care, and should be given attention in the interest of continuity of service as well as for safety and economy.

Chain Grate Stokers

(i) Replace worn rods and links as soon as possible.
(ii) Change grate rollers before wear is excessive.
(iii) Faulty " side air seals " should be renewed as soon as possible.
(iv) " T " bars and bearings should be replaced at regular periods.
(v) Gear-box oil should be changed as soon as any sign of heating occurs.
(vi) Ball races, worm shaft and gear wheels should be replaced every year.
(vii) Stoker shaft alignment should be checked every year.

Boiler Drums

(i) Remove scale as frequently as is necessary for economy.
(ii) Blow down as frequently as is necessary for economy, but not more.
(iii) Repair lagging that is faulty as soon as possible.
(iv) Make periodic tests for leaking tubes—expand where required.
(v) If corrosion or pitting is noticed in the drums it should be given immediate attention.

(vi) Where there is evidence of leaking seams of drums, have these caulked or welded.

(vii) If defective rivets are noticed these should be replaced as soon as possible.

Water Walls

(i) Remove all clinkers when the boiler is down for cleaning. Replace damaged blocks or bolts. Remove all scale from water-tubes and water-boxes.

(ii) Keep soot-blowers in working condition and renew or re-expand tubes when necessary. Renew tube-spacers and bolts when required.

(iii) Remake header joints periodically.

Economiser

(i) Overhaul scraper gear (or blowers) periodically.

(ii) See that the tubes and gills are properly cleaned before the boiler is put into operation, and kept clean when in operation. Overhaul damper equipment.

(iii) Clean scale from tube interiors when inspection shows it to be necessary.

(iv) Replace corroded tubes and casing when necessary.

Fans

(i) Periodically clean fan runners (forced draught), take up the fan bearings.

(ii) Overhaul all fan motors each time the boiler is being cleaned.

(iii) Take up fan bearings for induced draught fan, and search for defects about its runner when the boiler is being cleaned.

(iv) Inspect dust collector lining periodically and renew when necessary.

Refractories

(i) Search for faulty baffle supports, and carry out necessary repairs or replacements to damaged baffles, arches and brick setting and casing.

Air Heater

(i) Clean out gas passage whenever the boiler is down for cleaning. Look for and repair where required heater casing, to prevent air or gas leaks.

(ii) Overhaul soot-blowers, and renew corroded plates or elements when boiler is down for cleaning.

(iii) Overhaul all steam and water valves at regular periods.

(iv) The points detailed above are vitally important both in the interest of efficient operation and maintenance of continuity of supply. There are other points, but these are the most important.

Daily Inspection Necessary

Whatever the size of the plant it is desirable that individual responsibility should be placed on someone to make inspection daily for leaking joints, valves and steam traps, and faulty insulation of pipes and tanks containing either steam or hot water. All of these should be reported to the engineer for his attention, and he in turn should present a statement of such reports to the management each week, and also indicate what measures have been taken, and whether all the losses have been eliminated. In many factories where steam is utilised for power production only, the total heat usefully employed is as low as 10 to 15 per cent. of that supplied to the boilers, while in the most successful of large power stations, where usually everything is done that can be done to reduce heat losses,

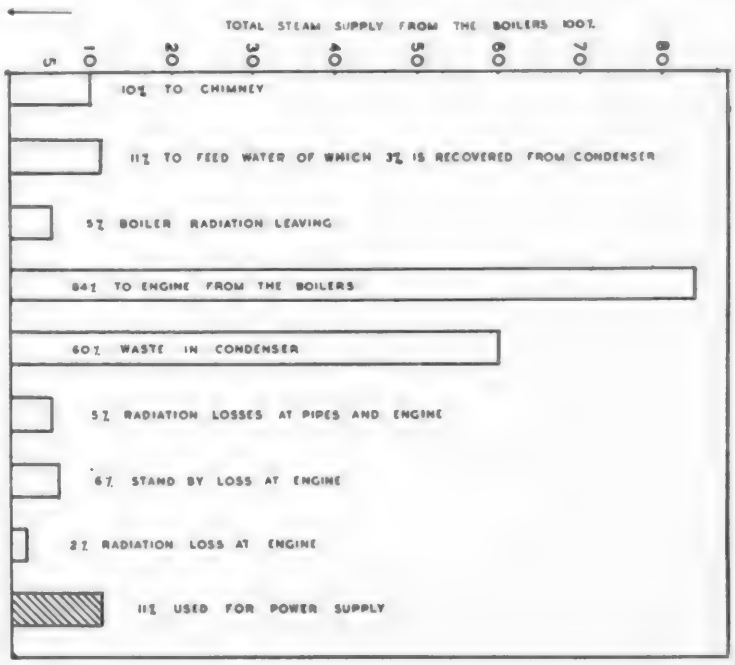

TOTAL STEAM SUPPLY FROM THE BOILERS 100%
0
20
40
60
80
100%
10% TO CHIMNEY
11% TO FEED WATER OF WHICH 3% IS RECOVERED FROM CONDENSER
5% BOILER RADIATION LEAVING
84% TO ENGINE FROM THE BOILERS
60% WASTE IN CONDENSER
5% RADIATION LOSSES AT PIPES AND ENGINE
6% STAND BY LOSS AT ENGINE
2% RADIATION LOSS AT ENGINE
11% USED FOR POWER SUPPLY

Fig. 1.—Showing how steam is utilised in many factories where it is generated for power purposes separately from that required for processing and heating.

The shaded portion shows percentage of fuel usefully consumed. On a very well-run plant this may reach 17 or 18 per cent.

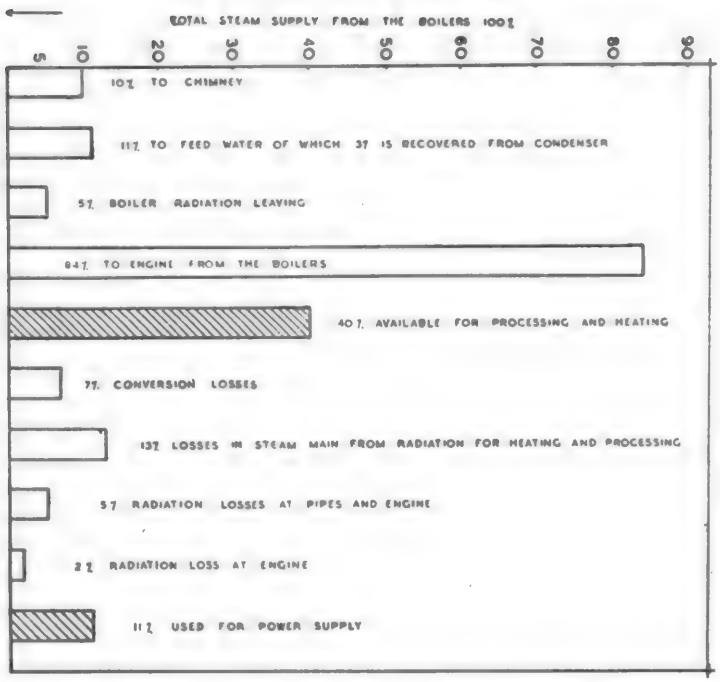

TOTAL STEAM SUPPLY FROM THE BOILERS 100%
10% TO CHIMNEY
11% TO FEED WATER OF WHICH 3% IS RECOVERED FROM CONDENSER
5% BOILER RADIATION LEAVING
84% TO ENGINE FROM THE BOILERS
40% AVAILABLE FOR PROCESSING AND HEATING
7% CONVERSION LOSSES
13% LOSSES IN STEAM MAIN FROM RADIATION FOR HEATING AND PROCESSING
5% RADIATION LOSSES AT PIPES AND ENGINE
2% RADIATION LOSS AT ENGINE
11% USED FOR POWER SUPPLY

Fig. 2.—Showing decreased heat losses when all steam exhausted from the prime mover is utilised for processing and/or heating.

The shaded portion shows percentage of fuel usefully consumed.

the efficient use of heat is not more than 25 per cent. That difference *can* be secured in the smaller plants, and represents a considerable saving in fuel. Below are some authentic figures of analysis of costs in a very large power station in terms of percentage. As this power station is considered to be among the best operated plants in this country it might be of interest to compare them with *your* costs for power.

	Per Cent. of Total Running Costs.
Coal	68·43400
Oil, waste, etc	0·00088
Repairs (labour costs)	5·38100
Repairs (materials)	15·35600
Workmen's wages	7·58600
Salaries (staff)	2·40300
	99·16088

The remaining 0·84 per cent. will be accounted for if the figures are run out to several more decimal places, but that is unnecessary. Reference has been made in previous issues of FOOD MANUFACTURE to the fuel saving that can be effected by using prime movers which discharge steam from their exhaust (after converting sufficient heat energy into enough mechanical energy to meet all power demands for the factory) into the various processing departments.

A diagram illustrating the distribution of heat leaving boilers to be used under ordinary condensing conditions, compared with a diagram showing heat distribution where a " back-pressure " prime mover is in use will be more illuminating than a lot of statistics. Fig. 1 shows the heat flow where a condensing prime mover is in use, any steam required for process use being supplied by low-pressure boilers which are not used for power supply. Fig. 2 shows the heat flow where the prime mover not only supplies power, but is also used as a reducing valve to reduce the steam at boiler pressure to the pressure required for process work.

In conclusion, an actual case of coal economy in a food factory may be usefully cited, as it shows what savings in fuel cost are possible to achieve by scientific methods.

The factory consumed 100 tons of coal per day, the coal costs, delivered, being £2 per ton. The evaporation of water into steam was 8·15 lb. of water per lb. of coal consumed. In less than a month, without any expenditure of money on apparatus (a Lea recorder for water measurement had been in use for some years, as had satisfactory coal weighing apparatus), as a result of improved control and methods of firing the evaporation was increased to 9·3 lb. of water evaporated per lb. of fuel consumed. This was an increase of evaporation of 1·15 lb. of water per lb. of coal consumed. This factory worked day and night continuously for six months each year, say, 182 days per year, and as 100 tons of coal per day were consumed, that means that 18,200 tons of coal were required to generate steam for power and process work, the fuel costing £36,400 for the six months. By evaporating 1·15 lb. of water more, for each lb. of coal consumed, the coal bill was reduced by over one-tenth, representing a saving of £7,280 per annum at a cost of £800 per annum for specialised supervision. Subsequently, by the introduction of economisers and instruments for scientific control of steam production and usages, the evaporation rate rose to 10·5 lb. of water per lb. of coal consumed, which showed a big annual saving for years after the latter improvements had been introduced.

Fuel and Power

A Symposium

Seven Ways of Wasting Steam

L. G. Northcroft, B.Sc., A.M.I.Mech.E.

IF THOSE folk who use steam for process work or heating would always bear in mind one basic fact they would have gone a long way towards fuel economy in their works. Steam is generated to provide a simple means of conveying chemical energy from a lump of coal to heat energy inside a jacketed pan or a pipe coil or wherever it is used. By all means see that little of the chemical energy in the coal is wasted in making the heat energy in the steam. But remember that it is the heat energy in the steam which is the valuable commodity and so take all possible steps to see that you don't waste it *after* the boiler.

Steam Leaks.—Steam at 50 lb. pressure blowing through a $\frac{1}{8}$ in. hole will waste as much as 27 tons of coal a year. You probably haven't a single steam leak of this size; but what about the leaking pipe joints, the stop valves which won't quite stop, the leaking steam traps and the drilled plug cocks for discharging condensate?

A pipe joint which weeps is not often the fault of the fitter. See if the steam line has a fall (about $\frac{1}{16}$ in. per ft. in the direction of flow), see that it is properly drained with a steam trap at its low point (or points), see that it has no sag between fixings. Leaking joints may so easily be caused by unequal expansion due to condensate lying in the line or by water hammer caused by pockets of condensate.

About stop valves—well, the proper maintenance of them should be a routine job. Just the same applies to leaking steam traps. But it's worth while thinking what makes them leak. A great cause is dirt or pipe scale in the line. If you try to shut a stop valve which has a piece of scale on the seat you may eventually get it down, but you may also score the seat so that it's never quite tight again. And scale in a steam trap may even prop the valve open and give you a really expensive blow. Pipe strainers are the cure.

The drilled plug cock to discharge condensate is, in a food factory, the most serious steam leak. If you have an operator to turn the plug cock each time the condensate rate varies then you will certainly be safe. But how does the operator know when the rate varies? And who can afford labour for such a job? Need it be pointed out that a steam trap is an automatic valve which is designed to do exactly this job for you?

Wasted Condensate.—If you put hot condensate down the drain you are wasting from 9 to 11 per cent. of your coal. This is the value of the heat in the condensate which should be returned to the boiler feed tank.

Nor is the heat content the only waste. By wasting condensate you are wasting water which has to be pumped from somewhere by someone. You are using more softening or conditioning salts for your boiler feed than you need (condensate being soft water). You are blowing down or de-scaling your boiler more often than should be needed.

Corrosive or contaminated condensate should not be returned to the boiler, but even this, if not too bad, can often be used for heating the odd room or providing hot washing water.

Air in Steam.—Air and other gases are present in your boiler feed water and are carried into the steam spaces with the steam. Steam spaces are full of air when a plant is started up. If this air gets mixed up with the steam it has two serious effects. The temperature of an air-steam mixture is less than that of pure steam. For example, steam at 50 lb. gauge should be at 297° F.; but 10 per cent. of air will reduce this temperature to 291° F. (which corresponds to a steam pressure of 43 lb.). If you got rid of this air you would be able to reduce your steam pressure from 50 to 43 and still get the same results.

Indeed, better results—because air in steam has another and even more serious result. Steam in a vessel is continually moving towards the walls on which it is condensing and giving up heat. Any air present is also carried to these walls; but, of course, it cannot condense, so there it tends to stay and forms an insulating film. Since one-thousandth of an inch of air offers an opposition to heat flow equal to 19½ in. of copper, you will see that there is quite a lot to be said for getting the air out of your steam spaces. It can be done by the proper use of thermostatic air vents.

Badly Chosen Steam Traps.—You must know that the functions of a steam trap are to discharge condensate and to keep in steam. Some types of steam trap discharge condensate, we might almost say, at any cost. That is, they pass it out as soon as it forms and at steam temperature, and even go so far as to make some of their own to keep themselves working. Other types hold up condensate until it has cooled to 212° F., or even lower. They each have their uses, but they are not interchangeable. No single type of steam trap is suitable for all jobs. If you were unfortunate enough to use a get-rid-of-it-at-all-costs trap when you might be using a hold-it-back-till-it-cools type it would be possible for your steam consumption on that unit of plant to be 12 per cent. more than necessary.

If, on the other hand, you cannot use any of the sensible heat of the steam before discharging it and you had a hold-it-back-till-it-cools trap, then you would be waterlogging your plant and slowing down your production. The best plan is to get in touch with a steam trap-maker and ask him about it.

Badly Fitted Steam Traps.—You fit a steam trap to get water out of your plant. So you must put it so that *all* the water can reach it. For example, if you want to drain a 6-in. main, don't tap into it with a ½-in. pipe leading to the trap. Most of the water will by-pass the small hole, especially at a time of heavy load when the steam velocity is high. Since this is also the time when most water will be present, you haven't done yourself much good. This is only a simple example; there are so many ways of fitting steam traps badly, that once again we must say—ask the steam trap-maker for advice.

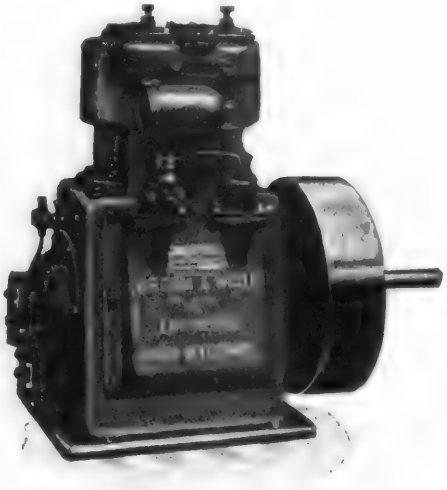
Unlagged Steam Pipes.—Those small steam pipes in your works—say only 100 ft. of 1 in. pipe carrying steam at 100 lb. pressure all day and night, can you really afford to waste 20 tons of coal a year, just because you haven't bothered to lag it? That's what it's losing for you. Surely, in these days of coal restrictions (which are certainly not going to get lighter) you can't afford to have even one flange uncovered. It seems only elementary common sense.

Steam Pressures too High.—It is most economical to generate steam at as high a pressure as your plant will allow. Distribute it at this pressure too and save pipe size. But don't use it at a high pressure if it's heat value that you want. An example may help. Steam at 100 lb. pressure in condensing gives up 881 heat units per lb. and forms 1 lb. of water at 338° F. Steam at 50 lb. pressure gives up 911 heat units and forms 1 lb. of water at 298° F. If your equipment, by careful attention to the points briefly described, can be made to give the output you require by steam at 50 lb. instead of 100 lb., then not only do you get 3 per cent. more heat out of each lb. of steam, but the heat carried away in the condense (a proportion of which is bound to be lost) is less.

Air Compressors

A single stage air compressor which is of particular interest incorporates a mechanically operated suction or inlet valve. It is claimed that the positive opening of the valve ensures the highest possible volumetric efficiency, since the cylinders are fully charged with air at atmospheric pressure without wire drawing through the valve. The suction valves are of the mushroom type and are actuated by a cam gear driven from the connecting rod big ends, as shown in the sectional drawing. This principle allows the valve to be given a quick opening and a large lift, and to seat again smoothly without shock.

Specially designed automatic spring loaded plate type valves are used, and these are fitted at the side of the cylinder head. An immediate advantage of this position is that the whole of the cylinder head proper is made available for water cooling, and it is, of course, at this point that cooling is most effective, due to the fact that at the end of the stroke compression temperature is at its highest.



An adjustable automatic air governor is fitted and is connected to the air receiver. When the pressure in the latter reaches the desired maximum, the governor admits compressed air to an unloading cylinder which is mounted over the suction valve cam. This, as seen in the sectional drawing, unloads the compressor by lifting the suction valve off its seat, and the machine continues to run on frictional load only until the air receiver pressure falls by, say, 8 to 10 lb. per sq. in., when compression is allowed to recommence.

Forced lubrication to all bearings is provided from a valveless plunger type oil pump driven direct from the end of the crankshaft. Excessive oil pressure is relieved by an adjustable regulator.

This particular type of compressor is made in five sizes ranging from 48 to 252 cu. ft. per minute displacement. Normal working pressure is 100 to 120 lb. per sq. in. When used as vacuum pumps they are capable of creating a vacuum of within 2 in. of the barometer.

There are also other machines made by Broom and Wade, Ltd., ranging from 2 to 5,350 cu. ft. piston displacement, and their designs cover single and two stage, single-acting and double-acting plants.

Boiler-House Instruments

For the supervision and control of boiler plants there are many instruments available, irrespective of whether the primary source of heat is coal, oil, gas or electricity.

CO_2 Meter.—The most important measurement from the point of view of operating efficiency and economy is probably the CO_2 content of the flue gases. The Elliott-Siemens CO_2 Meter—which can be supplied as an indicator or recorder—will enable the stoker to know when to cut down excess air. The instrument employs the "Siemens" principle of gas analysis.

Combustion Heat Loss Recorder.—This instrument, which is an improvement on the ordinary CO_2 meter, has been designed as a unique, direct-reading recorder for the combustion engineer. A CO_2 meter, although giving information concerning the combustion of the fuel, does not always indicate the best thermal operating conditions. Its readings are a measure of the excess air, but it does not take into account the variations of the flue gas temperature. The combustion heat loss, however, can be calculated from the CO_2 and temperature of the flue gases.

This calculation, together with the results of a great number of tests, has been utilised in the production of an instrument reading directly the percentage of combustion heat loss. The instrument consists of an electrical CO_2 transmitter and pyrometer stems, whose readings are combined in a recorder with a special cross coil movement.

The instrument has the advantage that an increased significance is imparted to a comparatively small change in CO_2 and flue gas temperature readings.

It supplies a definite need in boiler equipment, whereby, in drawing immediate attention to alterations in working conditions, the combustion engineer is enabled to detect incorrect firing or faulty operation

Weameter Test Set.

of plant without the necessity of making continuous calculation.

Portable CO_2 and Temperature Indicator.—This apparatus enables readings to be obtained on one indicator of the percentage CO_2 content and the temperature of the flue gases. The above and other instruments such as temperature indicators and recorders, steam flowmeters, etc., are made by Elliott Brothers (London), Ltd.

Mixed Industrial Driving

Many industrial establishments are still operated on the principle of rope or belt driving from condensing steam-engines, and it is well known that a most efficient arrangement, when the time comes for modernisation, is to use a steam-turbine, running at, say, 5,000-6,000 revs. per minute, erected alongside the engine, replacing the latter, but retaining all the original rope drive. In addition, the turbine can be arranged to generate electricity for lighting and power use, using, say, single reduction gearing for A/C, or with direct coupling for D/C. Further, the turbine may be of the pass-out or back-pressure type, providing all the heating and process steam required, giving a very high overall thermal efficiency.

Operating in the field of the impulse industrial turbine, pass-out, back-pressure, condensing and mixed pressure, within the range of, say, 20-4,000 h.p., are Hick, Hargreaves and Co., Ltd., who incidentally were one of the pioneers both of the large compound mill engine and the rope drive. These turbines are specially built for industrial conditions, one point being, for example, easy accessibility to all the vital parts such as governors, valves, bearings and pedestals.

As the result of the very extensive experience obtained, also the small back-pressure turbine, even of 20-100 h.p., is just as reliable today for every description of industrial drive as the steam-engine.

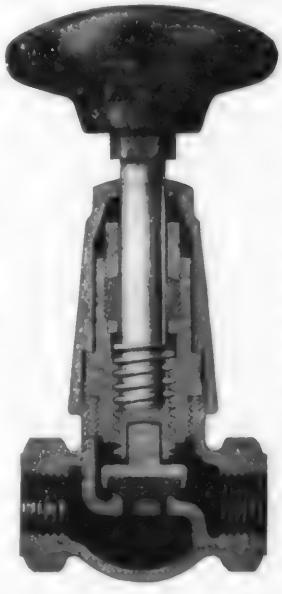
A typical arrangement is a 2,000 h.p. condensing set, operated in conjunction with the firm's lower level jet condenser and " Hivac " air ejector, driving a mill by a main rope drive and a direct-coupled D/C electrical power and lighting set. Also the condenser extraction pump is rope driven in convenient fashion from the main pulley, whilst for starting up an auxiliary steam ejector is used, which withdraws the condenser water until the main pump is up to speed, so that the plant is independent for any external source of power.

Soot Blowing Equipment

Automatic soot-blowing, with its greatly increased efficiency in steam raising and its considerable reduction in labour charges by minimising the use of the " human element ", is steadily becoming recognised as an important adjunct in connection with modern boiler installations. The patent automatic soot-blowing system recently developed by Hopkinsons, Ltd., is comprehensive in its scope; operation of the master steam valve, time control of the drainage system for the piping and automatic operation of a sequence of blowers are all carried out by merely pressing a button. The entire control equipment, with the exception of the electrical units on each soot-blower, is housed in a cubicle suitable for location on the firing floor, an important feature being the mimic boiler diagram, together with the signal lamps for each blower, on the face of the cubicle.

The attendant can check over the operation of the scheme at a glance, and if a blower should exceed the predetermined operating time, or actually fail, this fact is indicated at the cubicle by audible and visible alarms. A special isolating switch completely isolates the blower head in question and allows maintenance work to be commenced while the remainder of the system is still in operation. The operation of the blowers in any desired sequence is carried out by a rotary sequence switch in the cubicle, and individual blowers can also be arranged to operate a number of times if found necessary.

Valves.—In connection with food manufacture, the " Easy-clean " valve, manufactured by the same firm, and illustrated here, is specially designed to prevent the accumulation of dirt and dust, and the lid and gland nut are completely enclosed by a smooth-surfaced shroud or cover. Sharp corners are avoided as far as possible on the exterior of the valve, which can thus be cleaned very quickly. Chromium plating of all external metal surfaces further promotes a neat appearance, consistent with the surroundings and associated plant. The valve is designed as a simple screw-down stop valve, the body, lid and internal fittings being of bronze, the valve facing of special composition while the solid handwheel is a plastic moulding.



Steam Pipe-Line Equipment

Steam pipe-lines must be maintained as efficiently during war-time as in the days of peace. The exacting restrictions in effect today make it very necessary for the utmost care to be taken with existing pipe lines, so as to eliminate the need for new material.

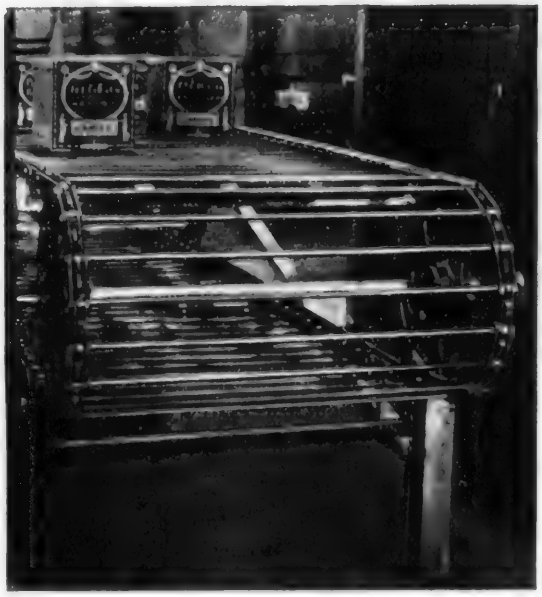
Manufacturers of malleable iron pipe fittings, valves in gun-metal and cast-iron, flanged fittings, steam traps, reducing valves, etc., are Crane, Ltd. Such a range is, of course, in the front line of restriction, and the manufacturing resources of the firm are now largely used in support of a " line " much more animate than a pipe-line, and stretching across seven seas.

Engineers are advised to specify taper thread when purchasing gas fittings, to use screwed valves and fittings in place of flanged, when possible, for the sake of economy in metals, to install a modicum of unions in the pipe-line to facilitate the incorporation of any new additions which may become necessary. Steam traps should be chosen on a capacity basis and not on the basis of size, as so often happens, to ensure that steam-heated vessels are operating at maximum efficiency. This care in selection should be applied also to reducing valves, as a reducing valve too large for the job is almost as inefficient as one too small.

The Crane D7 for 150 lb. S.W.P. and the D46 for 250 lb. S.W.P. are two G.M. valves specially designed for heavy duty on steam-power plants.

Steel Roller Chains

The reduction of power transmission losses is a fruitful field in the national campaign to make the most efficient use of fuel and power. In this the precision steel roller chain offers a valuable contribution. A certified test made at the National Physical Laboratory on a Renold stock roller chain drive shows that its efficiency lies between 98·4 and 98·9 per cent. The power loss in this type of transmission is therefore negligible. The chain drive being a positive transmission does not permit slip to occur and shafts so connected always run at their designed speeds. This is a very desirable feature at any time as maximum machine output is thereby maintained, and it is of paramount importance where



Conveyor for Biscuit Tin Drying.

machine operations are synchronised, such as packing and canning machinery.

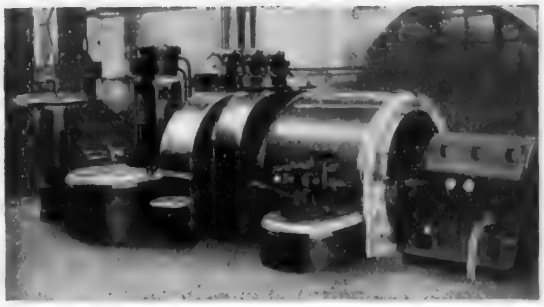
Steel chains employed for transmission or conveying are unaffected by damp and heat of the degrees obtaining under normal factory conditions. For process work where more arduous conditions prevail it is possible to protect the chain by various methods or by manufacture in suitable grades of stainless steel. Where necessary, use of stainless steel chains ensures that food products are uncontaminated.

In addition to its proved reliability, the roller chain when used either for power transmission or for mechanical handling purposes is a markedly smooth medium, fulfilling its duty with quietness and efficiency.

When used for power transmission it is common practice to enclose the drive in a chaincase incorporating suitable lubrication method. Not only is long life assured by efficient lubrication, but the requirements of the Factory Act for guarding are met, as also are the modern hygienic standards obtaining in the food industry.

Back-Pressure Turbines

Mechanical energy such as is required for factories is usually provided by conversion of heat energy by a machine called a Prime Mover. This may be one of numerous forms such as various types of internal combustion engines or some form of steam engine or turbine. In many cases the internal combustion engine uses the heat supplied to it in the form of gas or oil, and a number of thermal losses do not exist as in the case of a steam-driven engine or turbine when working with condensing equipment, which is utilised to create a vacuum at the exhaust in order to reduce the back-pressure. In factories where process steam is required in quantity the most efficient type of prime mover is, without doubt, the back-pressure turbine.



The use of this system provides, for the processing, steam which has previously converted heat energy into mechanical energy at a turbine (or engine) and, as it does not require a condenser with its auxiliaries, is installed at lower capital cost, as well as reducing running costs because the provision of circulating water at the condenser is not required. This system is at its best when the demands for steam and electrical power are fairly well balanced, but where there is some variation in that respect arrangements can be usually provided to maintain a high overall thermal efficiency. An illustration of a machine of this type, made by the English Electric Company, Ltd., is shown. For factories where the steam requirements for processing plant is not sufficient first of all to drive a prime mover large enough to give the power required for the factory, it is good practice to install a mixed pressure turbine. This may be thought of as a low-pressure turbine equipped with a number of high-pressure stages, and these utilise additional high-pressure steam when the whole of the available low-pressure steam is not enough to meet the demand for power. Where power demand is from 500 to 3,000 k.w. per hour, very efficient pass-out (or, as they are sometimes called, "extraction" turbines) turbines are available, and in the smaller sizes the need for expensive excavation to provide space for condensers and auxiliaries is avoided, as the condenser is mounted at floor level, and the extraction pump from the condenser is driven mechanically from the low-speed shaft, and the circulating water pump coupled directly to one end of the unit.

A Large Gas-Fired Travelling Oven

Before the war gas was firmly established throughout the food manufacturing trades as an efficient, speedy, and economical fuel, and the demands of wartime production have largely increased the call for gas-fired equipment of all kinds.

Gas is being used in the manufacture of margarine, edible oils and fats, in bakeries and biscuit-makers' establishments, in the milk trade and in the making of confectionery, to name but a few branches of the food industry.

A large confectionery bakery in the North of England changed over within recent years from oil-firing to gas with very successful results. A 14-ft. hot plate and two two-deck Peel ovens were first tried on gas firing, and it was found that the conversion led to very much speedier working, the plate being ready for use in a few minutes and alterations in temperature being quickly effected; it was possible, too, to heat up merely a portion of the plate if output did not require the whole hotplate to be used.

The firm then installed the two-deck oven illustrated. This has three conveyors, one spanning the whole width of the oven and two each being half the width. The speed of the individual conveyors can be varied as required. This oven has replaced nine 1-sack steam tube oil-fired drawplate ovens, over which it has a potential increased output. Its introduction has also resulted in considerable economy in space, a greater flexibility in control, with consequent quick changes of temperature for the various types of product, and large savings in labour and fuel.

A Pelkman Travelling Oven with two decks and three conveyor discharging end, installed at the bakery of Richard Taylor and Sons.

(*Courtesy of The British Commercial Gas Association.*)

A Scientist looks at Food Control

HUGH NICOL, M.Sc., Ph.D.(Lond.)

An extract from a forthcoming book by Dr. Nicol—*Science and Opinion in the Modern State*. This book is not concerned with science and discovery applied to the production of things: it sets forth the thesis that there exists a body of scientific knowledge capable of being applied to determine the rational use of things and of ascertaining the relative merits of different procedures. Food control is here examined from a severely scientific standpoint, and its success is accounted for by the fact that it is almost the only department of national enterprise in which scientific method has no scope. Unlike other national activities concerned with the production, use and distribution of materials, food control depends for its success or failure upon traditional administrative methods of thought and action.

IT is undeniable that during the past few centuries human behaviour has in some respects become increasingly rational. We do not now believe in incantations as a remedy for disease, nor do we rely on displaying a large bronze image of an insect to keep away malaria, as they once did in Naples. To a scientist it is also undeniable that the adoption of science has not gone as far as it might in view of the means available. There is something akin to faith in witchcraft in the recurring appeals to find some strong man, in the belief that problems of supply and production will yield to his powerful medicine. Such problems, being multifactorial and dynamic, can be represented only by complex mathematical equations; and, to solve these, personality is inadequate. It is a lingering belief in an old tradition, derived from a time when national problems were less complex and remained within the compass of one man's grasp, that still demands a personal instead of an objective solution of these types of problem.

The Black-Out

The complete black-out on land is the result of a guess that has been erected into a dogma. Those who would protest about it are more in the position of Galileo than of John Hampden. It can be shown that the black-out violates a fundamental principle of which particular applications are well known to chemists and to electrical engineers. Evacuation of children has been criticised by Mrs. G. D. H. Cole as "male and military", though that remark refers to the manner in which billeting was performed rather than to the presumed principle underlying the policy of evacuation. Evacuation, or "dispersal" as it is sometimes called, seems to be the only recent policy about which it has been even dimly realised that it might have a mathematical basis; yet that basis has not been properly brought to light, nor has it been examined in relation to other policies. For example, if the black-out were successful in its aim of ensuring that bombs could be dropped only at random, dispersal would have no value. Contradictions and inconsistencies will necessarily arise when scientific matters are dealt with by people not endowed with a scientific training. Such anomalies will persist until the level of the national mental equipment becomes commensurate with the problems with which the nation has to deal.

Food Control and Rationing

Reviewing the wartime spheres of activity in Britain one success is apparent. In spite of minor failures and undesirable features (notably the formation of private companies for public purposes) the rationing of food has been, on the whole, well done.

Amongst all the administrative exercises of the war, food rationing has been the most successful. Why? Because it is the easiest. Involved in it is no mathematical principle more abstruse than that presented by the division of one number by another. The quantities to which it applies are not strictly fixed: stocks in hand may vary from time to time from nothing to a surplus over probable needs, so that from a business man's point of view they would be considered as fluctuating—and the uncertainty of supplies would also appear to a business man as an additional complication; at the other end, population, whilst almost constant in total numbers, is liable to relative displacements. Yet, from a mathematical point of view, such variations in supply and in areal demand do not change the nature of the problem; the problem remains as a division of x by y. These divisions need to be repeated many times with values of x and y that are not the same at all times, but are static at any one time; and no knowledge of dynamics is needed ever. Hence, the solution of the problem should be within the grasp of any administrator, since an administrator would not be an administrator if he could not do simple arithmetic.

The Apparatus of Distribution

The actual division ("distribution" in the trade sense) is effected mainly through channels and "machinery" that were already in existence and required merely to be adapted to new conditions. The apparatus of food distribution consists of the food trades, and, for most people, of the housewife. The former needs no comment; of the latter it suffices here to say that she costs the nation nothing except her keep and is one of the most economical parts of a "machine" that any administrator could hope to have. Doubt has been cast upon her value by believers in communal kitchens, so as to lead one to think that they must be either old maids or childless old men; but when one reflects how incompletely homes would have been run if all food had been distributed at restaurants and public kitchens instead of most of it having been distributed through the activities of the

housewives, one will see that the housewife is a valuable, if unrequited, part of the machinery of *effective* distribution of food.

Policy of Food Control

The fundamental decisions of food control are easy; several of them decide themselves. Everyone must have food, so that the rightness or wrongness of allocation does not arise as it does in other departments. In other departments of supply the matter of allocation may be crucial and the consequences of a mistaken decision or a hold-up of supplies may be serious; but on account of the wide latitude of the ordinary dietary, a decision to allot one kind of food rather than another is not likely to be very wrong.

This is true whatever the reason for which the preference is given to one foodstuff over another: whether it is done arbitrarily, deliberately "as a matter of policy", or because supply of one kind of food is lacking through *force majeure*, accident, or incompetence. Hence a controller of food has a task that is uncomplicated as compared with the job of a controller of production or supply. A food controller deals with problems having great inherent latitude, whereas in other spheres distribution is often a matter of the greatest nicety in allocation and timing.

Priorities in Control

The priorities in food control are of the simplest order. None of them is very compelling—in practice some are, and others could be, administered by the housewife for her family; kinds of food are widely interchangeable; and the quantitative range is small. As compared with industrial allocations and priorities, food control is simplified by the almost uniform demand: every person requires to be fed and to have much the same amount of food. One of the largest ranges is that of the daily supply of milk for a baby and an adult (a range only four or five to one).

There is little or no need or scope for methods such as the scientist alone commands, and the main problem yields to administrative measures of a static kind. There is considerable scope for technology in the appraisement and adaptation of food *values*, but such technological knowledge seems to be well utilised, and in any case its use is outside the province of the present discussion.

Part of the administrator's job is the control of "black markets". No scientific principle is involved therein, and the problem is properly administrative. It will be seen that the mathematical basis of food control is of the very simplest nature, and that there is nothing to prevent a capable administrator from making a success of the job of food rationing.

Clothes rationing follows similar lines, and does not need separate discussion. The limits of the clothes rations are necessarily more arbitrary than the limits of food rations, but since administrators are good at "thinking of a number", and later modifying their guesses if necessary, they are suited to the job. The guesses need not be very accurate: a large margin of error is permissible without the scheme being compromised.

Failures of Administration

It may be supposed that one of the failures of the food administration arose as soon as the administrative mind attempted to assimilate a scientific fact. (The word *scientific* is here used in its ordinary sense, though in so far as the scope of these remarks is concerned, the fact should be classed as technological rather than strictly scientific.) This concerns imported eggs, of which millions were received bad. The detailed facts are not accessible—as they would be in a scientific community—but it is difficult to see what reason underlay the decision to make large-scale imports of eggs, unless it were venality, political or commercial pressure, or knowledge of the fact that several pounds of grain is necessary to produce 1 lb. of eggs.* One can visualise a superior officer of the Ministry of Food having a doubt about the last-mentioned matter, and, on getting into touch with some college of agriculture and poultry husbandry, being informed that the college experiments showed that 5 lb. of grain were needed to be fed to hens before 1 lb. of eggs could be laid. "Good heavens. This must stop" we can imagine him saying, as he mentally cuts down by a large proportion the shipping space used for poultry products. The sequel we all know.

Multi-Factorial Problems

This kind of thing happens because the non-scientific mind tends to regard a scientific fact as sound in itself and neglects to apply the relevant qualifications. In other words, a multi-factorial problem involving several interactions is treated as if it had only the one or two aspects which the non-mathematical mind is able to keep in view at once. The ratio of five to one can be understood even by an administrator, but, with his mind fixed on this, he forgets that eggs are dainty travellers, while grain is one of the hardest to injure through such wartime contingencies as port delays; he also overlooks the possibility that results obtained under the experimental conditions of a poultry institute may not be equally valid where the birds are on free range.

This example is admittedly founded on speculation. It may not be the correct explanation in this particular case, but it can serve as a type of what happens when a non-scientist tries to put an interpretation upon an isolated scientific fact. When action is taken on such an interpretation the administrator is probably satisfied that he is basing his action on scientific knowledge or advice, and that he is therefore doing the modern and correct thing. Actually, the scientist in such a case is being permitted to function at only a low level of responsibility, just as a work of reference, is put back, inert, on the shelf after it has been consulted.

* The exact figure is not material to the argument. All that is material is that the figure supplied should be several times greater than 1. Thus, incidentally, another fundamental scientific principle is illustrated: that a high degree of numerical accuracy is often needless, and that approximate figures are often as useful as exact ones. Inattention to this principle leads to much waste of time in engineering production owing to the laying down of unduly precise dimensions in specifications inexpertly drawn.

Since this was written Major Lloyd George has referred in the House of Commons to "experimental shipments". This shows complete ignorance of what constitutes reasonable and valid experimentation. Better than any other example it illustrates the distance which separates the administrator from the scientist.

(*Continued on page* 100)

The Contamination of Foods by Poison Gases

Part I

W. R. WOOLDRIDGE, Ph.D., M.Sc., M.R.C.V.S.

THE IMPORTANCE of the service at present being organised by Local Authorities, at the behest of the Ministry of Home Security and the Ministry of Food, for the protection of foodstuffs from war gases and the decontamination and salvage of affected foodstuffs, needs no emphasis now that the position of the enemy is approaching that of one who must call upon every measure which may possibly assist him.

Gas Concentrations

The exposure of foodstuffs to concentrations of poison gas which are sufficient to incapacitate an unprotected human-being has comparatively little effect generally upon foodstuffs. Dangerous contamination can be achieved, however, by the high concentrations of gas liberated into the immediate vicinity of an exploded gas bomb or it can result from gas spray delivered by low-flying aircraft. Prevailing winds, structural conditions in towns, or other causes may lead to an increase in the concentration of gas in a confined space so that foodstuffs in stores may sometimes become contaminated in this way.

The effects of gas-contaminated foodstuffs upon a consumer range from the production of nausea or repugnance to the onset of an acute or chronic alimentary disturbance, sometimes resulting in death. It is clear that the public must be protected from the possibility of consuming gas-contaminated foodstuffs, and that steps must be taken to effect the salvage of such foodstuffs in view not only of their harmful effects but also because a change of taste or smell may result in unhappy personal reactions. The ultimate fate of contaminated foodstuffs will depend upon the possibility of effecting its decontamination without destroying its food value and before it undergoes decomposition.

Extent of Contamination

The extent of the contamination of a particular foodstuff will depend both upon its own composition and upon the nature of the gas. The character of the foodstuff, particularly in so far as it contains a high or low concentration of water or a considerable quantity of fat, will affect both the extent of contamination and the ease of subsequent decontamination. Watery foodstuffs absorb more readily than those containing little water such gases as phosgene and diphosgene, whilst gases of the mustard gas type penetrate more deeply into fatty or dry foodstuffs than into those containing a high proportion of water. Sometimes water will effect the decomposition of a gas and possibly remove its poisonous character thereby. Those like phosgene and diphosgene are fairly rapidly decomposed by water, forming hydrochloric acid and carbon dioxide. Mustard gas is slowly decomposed by water giving hydrochloric acid and the non-toxic thioglycol. Lewisite, on the other hand, although rapidly decomposed by water, forms a toxic arsenic compound, and affected foodstuffs thus still remain dangerous.

Protection.—Although the decontamination of foodstuffs affected by war gases is not usually a very difficult process, it is nevertheless easier to prevent such contamination than to remove it, while at the same time maintaining fully the attractiveness and nutritive value of the foodstuff. Protective measures should, therefore, be adopted at all food and fodder depots, in order to prevent, so far as possible, any war gases reaching the foodstuffs. This can be achieved by storing in suitably protected buildings, by the adoption of satisfactory screening, or by the packing of the foodstuffs into protective containers. Danger can be minimised by the suitable dispersal of the foodstuffs.

Wrapping materials afford foodstuffs a variable degree of protection from liquid contamination. Thus materials, such as open-work crates, baskets and sacks, which allow falling gas droplets to pass straight through on to the foodstuffs and those such as close sacking which absorb the liquid so readily that it almost immediately soaks through to the inner surface, afford only momentary protection, but those, such as glass or polished metal, which do not absorb the gas at all, give complete protection. A more detailed account of the protective value of packing materials is given in the pamphlet issued by the Ministry of Food entitled *Food and its Protection against Poison Gas.*[1]

Decontamination. — Decontamination of gas contaminated materials may be achieved by the chemical destruction of the gas, by its physical removal or by sealing the contaminated object in such a way that the gas vapours cannot escape. From the point of view, however, of the salvage of contaminated foodstuffs, it is better to group the available methods under the following eight headings :

1. Aeration.
2. Washing.
3. Removal of contaminated surface layer.
4. Suitable cooking.
5. Dilution by admixture with similar but unaffected foodstuff.
6. Appropriate chemical treatment.
7. Weathering.
8. The application of two or more of the above methods serially.

1. *Aeration.*—This is probably the most effective method of decontamination of foodstuffs as it effects the removal of the gas without using any procedure or agent likely to diminish markedly the value of the foodstuff. As a rule contamination causes no chemical change in the foodstuff, and hence if evaporation of the gas can be encouraged by the adoption of suitable measures, the gas can generally be removed sufficiently

rapidly to leave the foodstuff in a perfectly edible condition and with the minimum of change. Under reasonable conditions, an aeration period of 48 hours is adequate, but this may be shortened or prolonged, depending upon the volatility of the gas and the environmental conditions. The method can usually be applied with success to foodstuffs when the contamination is "slight," that is to say when the contamination arises from ordinary gas clouds or from spray from high-flying aircraft.

Decontamination by aeration can proceed unassisted, but the time required for the completion of the process is materially shortened by the adoption of certain simple procedures which hasten the evaporation of the gas. The contaminated foodstuff should be spread out as far as practicable so that the maximum surface is exposed to the air; when possible the material can be repeatedly turned or shaken. Foods stored in sacks or in permeable containers should be arranged so that the individual sacks are surrounded by air. An increase in the rate of evaporation can be achieved by ensuring rapid movement of the air over the contaminated surface. This can be secured by the construction of the decontamination building, or by the use of fans or other mechanical devices. The rate of evaporation may also be increased by raising the temperature of the foodstuff and its environment. One of the best methods for the removal of gas rapidly from affected foodstuff is to submit the latter to suction, the pressure of the overlying air thereby being reduced, and the gas vapour continuously removed. This last method is more costly and less practicable, however. Usually two or more of these aids to efficient aeration are employed simultaneously.

The advantages of aeration for the decontamination of foodstuffs are its relative ease of application, its negligible effect upon the foodstuff, and its comparatively low cost.

2. *Washing.*—Considerable decontamination of foodstuff affected with liquid gas can be achieved by careful washing with water, when the affected foodstuff can withstand this process. This method is useful particularly with those foodstuffs which have fairly hard and comparatively impervious surfaces and where washing can take place soon after contamination. It is also useful for washing down contaminated containers made of non-absorbent material such as bottles, tins, casks, etc. If a hose is used to assist with the washing, the force of the water must not be such that it damages the foodstuff, and care must be exercised to see that the washing water is conducted safely away.

Liquids other than water—*e.g.*, petrol, alcohol, etc.—may be used for the removal of liquid gas, but they exert their action more as solvents of the gas, whereas the main action of water is its mechanical removal. Other washing liquids cannot be used in bulk, and usually they are applied with a rag or other swab. Care must be taken to change the rag repeatedly and to avoid the spread of the contamination. All used swabs must be destroyed, preferably by burning. Sometimes much of the liquid gas may be removed from a surface by the simple process of mopping up with dry rags, sawdust, earth, etc.

These methods of removing liquid gas from affected surfaces are not methods of complete decontamination, but are useful methods to reduce materially a gross contamination.

3. *Removal of Surface Layer.*—Reasonable decontamination may frequently be achieved by removing the surface layer where liquid gas has affected foodstuffs of relatively firm consistence. This method is useful where the adhering liquid gas cannot be removed by washing as the gas has actually penetrated into the body of the foodstuff. The penetration is not as deep as is generally believed when the food material is not porous, and hence although the depth of the layer to be removed will vary to some extent with the nature of the foodstuff and that of the gas, it is rarely necessary to remove a layer of more than ½ in. in thickness. The contaminated removed layer must either be destroyed or, if its food value is to be retained, submitted to some further process of decontamination. Usually it is destroyed or passed on for manufacturing purposes. This small loss is justified as the greater proportion of the foodstuff is salvaged.

4. *Suitable Cooking.*—Cooking or heating of contaminated foodstuff, provided this is not carried out in a small sealed container, will generally result in the evaporation of the bulk of the gas: it must be remembered that the escaping fumes may be dangerous. Foodstuffs contaminated with mustard gas, however, must be decontaminated by boiling with water as dry cooking, such as roasting, grilling, or frying does not destroy the toxicity of the gas or drive it off, but usually produces poisonous oxidation products. Half an hour's boiling is usually sufficient, and one hour's boiling is adequate even for the heaviest contamination, unless the foodstuff is very fatty. The boiling water must be discarded despite the fact that it decomposes the gas. If an alkali such as soda is added to the boiling water the rate of decomposition of the mustard gas is increased. No cooking process removes the danger from a foodstuff contaminated with an arsenical.

5. *Dilution with Uncontaminated Foodstuff.*—If a foodstuff is only slightly contaminated with a poisonous gas, particularly if the gas concerned is not highly dangerous—*e.g.*, one of the lung irritants—its effect on the consumer can be minimised by mixing the affected foodstuff with several times (five or ten times) its bulk of similar but uncontaminated material. This will not only diminish the toxicity of the foodstuff below the harmful level, but it may also dilute any taint affecting the sense of taste and smell or overcome any diminution in the cooking quality of the affected foodstuff. This method is only suitable when dealing with powdered foodstuffs or those which can be mixed intimately with the wholesome material.

6. *Chemical Treatment.*—One of the most satisfactory methods of decontamination depends upon the destruction of the toxic substance by chemical means. This process is not so useful with foodstuffs as the chemical agents used are likely to affect adversely the appearance and quality of the foodstuff itself. For example, tear gases can be destroyed by a mixture of equal parts of glycerine and 50 per cent. caustic soda, but this treatment is obviously unsuitable in general for the salvage of foodstuff. Mustard gas can be destroyed by chlorination, using a bleach cream or paste and removing excess of the agent with water, again a method unsuitable for the direct treatment of contaminated food material. Chemical methods are, nevertheless, of service when dealing with certain contaminated food containers, and in the treatment of "meat on the hoof" and unskinned carcases.

7. *Weathering.*—Most contaminated foodstuffs will ultimately become free from gas if allowed to "weather" sufficiently long. The time necessary is generally too long, for the foodstuff would often go bad before it had been freed from the gas, and hence this method is of limited application where foodstuffs are concerned. Weathering is a complex process involving aeration, washing (rain) and heat treatment (sun), but without artificial aids to these operations. It is serviceable when dealing with certain contaminated growing crops or with various fodder materials. In the latter instance, the process may be assisted by spreading and shaking the affected material.

8. *Combined Methods.*—To ensure the most complete decontamination and the maximum of safety to the consumer, it is advisable to treat most contaminated foodstuffs by more than one of the above methods. A foodstuff grossly contaminated should generally receive a preliminary treatment by washing, removal of surface layer or with chemicals before it is submitted to aeration. The latter will reduce the contamination to negligible proportions, but considerations of complete safety, taint or impaired cooking qualities make it advisable to mix the treated material with wholesome foodstuff or to subject it to a suitable cooking process. Thus the decontamination of foodstuffs contaminated with war gases can be looked upon as a process taking place in three stages :

(*a*) The removal of "gross" contamination by washing (mopping, swabbing), by removal of contaminated surface layer, or by chemical treatment.

(*b*) The reduction of "slight" contamination to traces by aeration.

(*c*) Ensuring that trace contamination does not impair the quality or safety of the foodstuff to the consumer by carrying out suitable cooking or by admixture with similar but wholesome material.

Contaminated Foodstuffs and their Salvage

As a general rule foodstuffs contaminated by "war gases" can be detected by their smell and decontamination is said to be accomplished when the characteristic smell is no longer recognisable. This is not an infallible rule, however, as mustard gas and the arsenical gases can give rise to untoward symptoms when they are present in foodstuffs at concentrations below that detectable by smell, while other gases, such as the lung irritant and tear gases, give rise to disagreeable smells at concentrations well below toxic limits. It is advisable in cases of doubt, particularly when arsenic is suspected, not to release decontaminated foodstuffs until an analyst's report has been obtained.

Foodstuffs Affected with Lung Irritant Gases and their Decontamination

Although these gases do not affect foodstuffs dangerously, they usually give rise to disagreeable odours and tastes and, therefore, affected supplies must be decontaminated. As these are non-persistent gases decontamination can usually be achieved by aeration for 24 to 48 hours until the taste of the gas has been removed. Corn, barley, oats, flour and similar comparatively dry materials affected with chlorine, phosgene, diphosgene or chloropicrin can be rendered fit for consumption by intensive aeration, particularly if the foodstuffs be shaken and tossed about.

Bread affected by chlorine can be decontaminated by rebaking. Chlorine can be removed from raw meat by boiling, by cutting off the surface layer or by washing with a dilute soda solution : washing with soda, however, extracts nutrient material and increases perishability. The flavour of cheese exposed to large quantities of chlorine is markedly altered, and the fat is often oxidised, in which case aeration does not make the cheese fit for consumption. Chlorine does not affect cheese wrapped in foil. It is not possible to remove the taste completely from chlorine-contaminated milk by aeration or filtration.

Flour contaminated with phosgene or diphosgene may become sour and slightly unpalatable, and it is likely to make a poor loaf, but these drawbacks can be removed by aeration and subsequent admixture with unaffected flour. The outer layers of bread may become unpalatable, a defect which can be removed by re-baking or cutting away the outer portions and aerating. Cereals are very little affected by phosgene. Contaminated meat and fish may have slightly discoloured surfaces and cheese, butter, margarine and fats may be superficially bleached. Fresh fruit is practically unaffected, but dried fruits will usually have a tainted taste. Efficient aeration will correct most of these defects except the change in appearance, but meat products, fats and cheese will need prolonged aeration to effect complete decontamination. The taste of tea or coffee may be rendered bitter by contamination with phosgene or diphosgene, and although aeration will effect considerable improvement this should be followed by admixture of the tainted material with about ten times its volume of uncontaminated material. Phosgene and diphosgene both liberate hydrochloric acid quickly on contact with water or foodstuffs with a high water content. Usually thorough airing, particularly with a dry, warm current of air, will make the food fit for consumption, but if large quantities of these "gases" are absorbed by green foods such as cabbages, lettuces, forage plants, grass, etc., these materials lose their green colour, the shoots and outer parts become brown or withered and the plant becomes limp. Such plants have lost much of their food value and do not repay decontamination. Eggs are not affected by these gases, but a taint is usually imparted to milk.

The removal of chloropicrin from contaminated foodstuffs which contain little water can be readily accomplished by intensive aeration. It is not so easy to decontaminate foodstuffs containing a large proportion of water and usually such foods retain an unpleasant taste and have an irritative effect upon the mucous membranes and so cannot be considered fit for human consumption.

Foodstuffs Affected with Tear Gases and their Decontamination

Materials contaminated with the non-persistent tear gases can usually be rendered fit for human consumption by adequate aeration. Exposure of the majority of foodstuffs to high concentrations of the persistent tear gases for several hours renders them uneatable, mainly as the result of the imparted, very bitter, taste. Unfortunately, it is difficult to remove this taste by aeration, and in bad instances the contaminated food

may have to be rejected for human consumption, although it can generally be consumed safely by animals. On the other hand, aeration is satisfactory for the decontamination of foodstuffs slightly affected with these persistent tear gases. Liquid beverages, such as beer and milk, affected with persistent tear gases are usually rendered so unpalatable that they have to be destroyed.

Foodstuffs Affected with Nose Irritant Gases and their Decontamination

These arsenical smokes are not so readily absorbed as most other gases by foodstuffs, and as they are non-persistent, contaminated materials can be made wholesome fairly readily by aeration. As, however, these "gases" contain arsenic, aerated foodstuffs should not be released for human consumption until they have been examined by an analyst and pronounced safe.

Foodstuffs Affected with Mustard Gas and their Decontamination

Mustard gas, besides being the most effective war gas to use against human personnel, is also the gas likely to cause the greatest danger arising from the contamination of foodstuffs. It is highly persistent, stable, has great powers of penetration, is soluble in oils and fats and therefore readily penetrates into the skin of human beings and animals, it is effective either as a liquid or vapour, and its presence is not easy to detect by smell or immediate physiological effects. These are qualities which make it particularly serviceable as a foodstuff-contaminating agent.

Liquid mustard gas obstinately adheres to all objects, including foodstuffs, owing to its permeating action, its low volatility and its slow rate of hydrolysis; hence in dry cool weather affected foods may remain dangerous for many weeks. Foodstuffs slightly or heavily contaminated with mustard gas, whenever practicable, should not be released for consumption after decontamination until an analyst's report has been obtained. If this is not possible, the decontaminated material should be mixed with wholesome foodstuff, or appropriately cooked.

Slight contamination by Mustard Gas Vapour.—Foodstuffs contaminated by exposure to mustard gas vapour should be aerated as promptly as possible. Non-fatty foods, such as bread, cereals, rice, vegetables, white fish, dried fruits, tea, coffee, sugar, etc., are not affected very seriously, and prompt aeration will usually convert affected foodstuffs, except those of a fatty nature, into an edible condition. Fatty foodstuffs—*e.g.*, butter, margarine, cream, cheese, cooking fats, bacon, fatty meats and fatty fish—absorb the gas more readily, but usually it is concentrated in the surface layers and hence the removal of the superficial layer usually effects the decontamination, particularly if this is followed by a cooking process. Penetration of the gas does not usually exceed 2 cm. even after 24 hours' exposure to relatively high concentrations of vapour. Occasionally there is a slight loss of palatability with the non-fatty foodstuffs and a more marked unpalatability with the fatty materials.

Foodstuffs such as hay, straw and harvested corn which are slightly contaminated with mustard gas should be spread out on the ground in thin layers and exposed to sun and air with frequent turnings. The temperature should, when possible, be not below 68° F. The progress of decontamination is followed by testing the smell, but as a concentration of gas less than that required to give a perceptible smell sometimes causes ill-health, the decontaminating process should be allowed to go on for a time after the smell has disappeared. Furthermore, the decontaminated foodstuff should, wherever possible, be blended with wholesome products.

Cereals, such as oats, barley, maize and legumina, slightly contaminated with mustard gas can be decontaminated by cooking in small quantities for at least one hour. The cooking water should be poured off and decontaminated with chloride of lime. Large quantities of corn slightly contaminated can be decontaminated by aeration. Various kinds of bran and flour which are slightly contaminated with mustard gas may be used after removal of the upper layer and subsequent cooking of the remainder for at least one hour. (N.B.—The steam is poisonous.) The absorption of mustard gas by bran, flour, etc., leads to the formation of lumps on the surface and the penetration of the gas into the bulk of foodstuffs does not take place to any great extent. Provisions with a high water content such as green foodstuffs, root crops, etc., are not easy to decontaminate, but this can be achieved if the contamination is recent. In the case of lean meat, aeration should be coupled with removal of the surface layer. Slight vapour contamination of meat can be removed by smoking at a temperature of 167° F. for 3 to 4 hours.

Spray or Splash Contamination.—Relatively light contamination of exposed foodstuffs by very small drops of mustard gas does not necessarily involve the condemnation of the foodstuff. Where practicable, the surface should first be washed in a stream of water—*e.g.*, with potatoes, oranges, etc.—and the washing should be followed by aeration. Sometimes it will be advisable to cut away contaminated surfaces to a depth of ½ in. and aerate the remainder.

Owing to its fatty content, milk is able to retain a considerable quantity of mustard gas in a dissolved and undecomposed state. Such milk is unfit for consumption. If the machinery is available prolonged drying under reduced pressure but increased temperature can effect some salvage.

Other liquids, such as beer, cream, drinking water, etc., if contaminated by droplets of the gas, should be condemned.

Eggs contaminated by liquid mustard gas may be decontaminated by applying a paste of aqueous chloride of lime to the shell, and washing off soon afterwards. The taste is not affected by this process provided the washing is effected without delay and rapidly.

Mustard gas, even as droplets, does not penetrate into meat to any considerable extent provided the surface is unbroken; even after 48 hours it will have penetrated to no greater depth than 4 to 5 mm. Only about 30 per cent. of the gas actually penetrates into the meat and the remainder can be readily removed by washing. Usually the liquid remaining on the surface becomes less clear as the result of the infiltration of fat into it. In time the gas is decomposed and the resulting hydrochloric acid will gradually form with the proteins a thin protective film, which will hinder the further penetration of the gas. Mustard gas will penetrate the rind of bacon to a depth of 5 mm. in 1 to 3 days, but the

penetration will occur more quickly when the bacon is of looser tissue. The skin of dried sausages, such as salami and the dry treated surface of salted meats, impedes the passage of mustard gas and prevents its deep penetration. The artificial cellophane skins of sausages are more resistant to the passage of the gas than are the natural skins. Exposed meat products containing little water but a high proportion of fat, especially if their proteins have been denatured by previous treatment, are more liable to serious damage by mustard gas than are the raw products.

Meat products which are slightly contaminated with mustard gas can be made fit for human consumption by washing off the adhering drops of gas with water, using a brush or a piece of rag for this purpose. Meat well splashed with the gas should have the top surface layer removed to a depth of about 1 cm., care being taken during the removal of the layer not to spread the contamination to the newly exposed, uncontaminated surface. In cases of severe contamination the advisability of attempting salvage will have to be seriously considered. Badly affected meat can be decontaminated by boiling with water, preferably with the addition of salt. As soon as the water boils it should be removed and replaced by fresh water, this process being repeated once or twice. Roasting or frying does not effect this decontamination as the mustard gas is not decomposed thereby to non-toxic products, as oxidation of the thiodiglycol occurs giving rise to sulphone and oxides of sulphur.

Foodstuffs contaminated really severely with mustard gas liquid will generally have to be condemned. Heavy droplet contamination is always difficult to deal with, but such foodstuffs should not necessarily be condemned. When possible heavy surface contamination should be guarded against by the use of tins; any leakage of gas into the foodstuffs may then be dealt with by aeration. Prompt action in removing the outer layer of heavily contaminated foodstuffs, when this is feasible, will save the bulk. Splashed food-containers of solid metal can be safely treated with a watery suspension of bleach followed by washing with water; wooden barrels can be similarly treated but greater care is necessary in case the gas has been absorbed into the wood. If there is any suggestion of this the liquid contents should be immediately removed to other containers. Contaminated wooden and cardboard boxes may be treated with bleach suspension in order to reduce the risk during handling, but the important thing is to remove the boxes as quickly as possible to the decontamination centre, take off the casing and subject the foodstuffs to aeration. Contaminated sacks, hessian bales and crates should be similarly treated. All contaminated coverings should be destroyed after removal of the food material.

Foodstuffs Affected with Lewisite and their Decontamination

Foodstuffs contaminated with lewisite are treated in ways similar to those affected with mustard gas, but they should never be released—even after treatment—without an analyst's report certifying that the danger of arsenical poisoning is absent. Although watery foodstuffs readily decompose lewisite the toxicity remains, as the arsenic is not actually removed by this treatment.

(*To be continued*)

A Scientist looks at Food Control

(*Continued from page 95*)

While the imported-egg failure is typical of worse blunders elsewhere, it is actually only a minor blemish when food control is considered as a whole. Because the technique of food and clothes control is of a kind which lends itself to purely administrative measures, no scientist could hope to improve greatly upon the present methods of rationing. A scientist would be wasted doing arithmetic to find out whether 1 or 2 oz. of cheese is the right answer; and he would have to be an exceptionally good administrator to cope with some of the trade problems.

Scientific Method Overdue

In practically all other spheres of active national effort, however, the introduction of the scientific method is overdue. The type of problem for which the current type of administrator is equipped resembles a game of draughts, wherein the situation changes slowly and develops visibly; there is a wide choice of possible and useful moves; one piece is moved at a time, and most pieces are of equal value. Of this type are some peace-time problems, and, possibly alone amongst wartime activities, food control. Whereas common sense, determination and some arithmetic are adequate for such problems, the problems presented by other wartime activities require a treatment which is more akin to multi-dimensional dynamics. As no politician or administrator appears to have any acquaintance with mathematics beyond arithmetic, the recurrence of failures outside food control is no matter for surprise. The scientific approach is the only method able to deal with problems which involve many factors, most of which are varying at the same time. An untrained mind, not being equipped with the proper technique, simply cannot follow the mazy complications; its unaided attempt at unravelling the tangle has no more validity than plumping at a solution. A state of affairs in which the national fate depends upon intuition and guesswork is unfortunate; and it is more than disquieting to those who are aware that the requisite ability exists, but is not being called upon.

There may be—indeed, there must be—some able mathematicians in Government employ. It is impossible to escape the conclusion that they are employed at a low level of usefulness, " on tap but not on top ", or, if they occupy responsible posts, that they do not think of social problems except in conventional terms. Moreover, there are very able men possessed of modern technique yet quite unrecognised by Government.

Personality and intuition have their value, and they also have their limitations. If the key or combination that would open a strong-room door were lost, would it avail to send a forceful personality equipped only with a bunch of feathers?

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Bacteriology and Food Preserving

Part II

The second and concluding part of an article on food bacteriology expressly written in plain language for the layman in the food industry. Part I was published in the March issue.

J. G. BAUMGARTNER.

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Preservatives

IN ORDER to preserve a food it is not necessary to kill the bacteria in it, but to prevent their growth.

Since bacteria are unable to grow without abundant moisture, drying is an efficient method of preserving foods. This is typified in the preservation of milk as dried milk powder. The addition of salt has long been practised as a means of preserving food. In effect, salting may be described as a moderate form of drying, since strong solutions of salt extract water from the protoplasm of the bacteria and so prevent their growth. Bacteria, however, differ in their ability to grow in salted products. For example, most types are unable to develop when the salt content is above 8 per cent.; but the group known as the Lactic group, which produce lactic acid from sugar, can grow in 15 per cent. concentration. The members of this group are responsible for the fermentation of vegetables for pickle manufacture. In this fermentation the salt is kept at 10 per cent., thereby allowing growth of the lactic organisms whilst checking the growth of other types which might produce undesirable changes in vegetables.

The Halophiles

Another group, known as *halophiles* (meaning " salt-lovers "), can grow in salt solutions of 25 per cent., but the growth of all other types is prevented at this level.

Sugar in 60 to 70 per cent. concentration exerts a similar action to salt, and is widely used in the preservation of jam, jellies, sweetened condensed milk, etc.

Most bacteria are unable to develop in acid materials, and many products are preserved by adding acids, such as lactic and acetic acids. The preservative effect of vinegar is due entirely to the acetic acid it contains. Acids have a directly poisonous effect on the cell. A few types, notably the lactic group, are somewhat resistant to acid. It should be noted that different acids vary in their poisonous effect or toxicity. For example, acetic acid is much more effective than citric acid in similar concentration.

Combinations of sugar and acid, salt and acid, and sugar and salt are also efficient as preservatives, and are used in pickles and sauces. Particularly with a sugar and salt combination very much lower concentrations are effective than if each is used separately.

Smoking of Fish and Meat

Another form of preserving is " smoking ", as used for fish and meat. In this process the fish or meat is hung in the smoke of smouldering wood dust. The smoke contains creosote and similar substances with disinfectant properties, and these impregnate the food in sufficient amount to act as preservatives.

Another preservative, one of the few permitted in foodstuffs by law, is sulphur dioxide. This, however, is not to be confused with substances such as sugar and salt, as it is directly poisonous to the bacteria. It is widely used in the preservation of fruit pulps and fruit juices. It can be almost completely removed as a gas by heating the preserved product.

Apart from direct measures of control, such as heating and addition of preservatives, cleanliness and careful selection of raw materials can accomplish a great deal to minimise undesirable bacterial activity.

Bacteria in Raw Materials

It is essential that all food raw materials be sound and free from soil and filth. Even sound material will be the means of carrying large numbers of bacteria into the product, and, apart from considerations of flavour of the finished pack, unsoundness detectable by sight, smell or taste will mean an enormous increase in this number. Under such conditions the preserving or heating process may not be adequate. The necessity for thorough cleansing of vegetables cannot be overstressed. Soil is always heavily laden with bacteria—a piece the size of a pea may contain as many as ten million. Furthermore, these usually include the most heat-resistant types. An unfair burden is placed upon the heat processing of the pack if every effort is not made to remove all traces of soil from ingredients.

It is equally important that cans, jars and bottles should be clean. Bacteria are always associated with dust, hence dusty cans or jars should be washed before use.

Manufacturing Precautions

Having due regard to efficiency, the more rapidly the material is prepared, canned and processed, the less opportunity there is for bacterial activity. Particularly during warm weather, souring or fermentation of moist ingredients may occur within two or three hours.

Utensils and plant should be thoroughly washed between each batch. Unless this precaution is adopted, enormous numbers of bacteria may develop in the material left in the containers or plant, and these will be carried into subsequent batches. Washing of utensils should always be followed by drying or draining, particularly if there is delay between preparation of batches. Small amounts of water in which are dissolved even traces of food material may form ideal conditions for the growth of bacteria.

It should not be necessary to emphasise the need for rigid adherence to official recipes. Efficiency of processing or preserving may depend on the product having the correct consistency, salt, acid, sugar or water content, and careless weighing or measurement of ingredients will affect them.

Heat Processing

Of all cannery operations, processing of the food in the can is the most important. If the process is inadequate or carried out inefficiently, the product and all the work put into its manufacture may be lost. By " process " is meant the time and temperature at which any product is heated to preserve it. Several factors have to be considered in the setting of a process. First, the rate of heat penetration into the product must be known. Obviously, a thin liquid such as clear soup will heat up more quickly than a solid meat pack. There will also be a difference between two thin liquids if one contains solids such as peas or beans. As stated above, the presence of acid in the product has the effect of reducing the temperature or length of process necessary. Consideration must also be given to the resistance to heat of the bacteria likely to be present.

The filling temperature is important for two reasons. If the can is closed while the contents are cold, expansion of the contents and the air in the headspace will result in straining of the seams when the can is heated, with consequent risk of leakage. Secondly, if the can is hot when entering the retort, less time will be necessary for it to reach the desired temperature. The time so saved is often important. All these factors can be studied in the laboratory, and the results obtained used in setting the process. The processing conditions finally arranged must be sufficient to kill all bacteria and spores capable of development on storage, but the effect of the heating on the appearance of the product must also be considered. It is useless to destroy the bacteria if in doing so the product is spoiled by overcooking. Accordingly, in some cases the ideal process, as assessed by the laboratory, has to be cut to preserve the appearance of the pack. It is therefore at all times essential to work strictly to the times and temperatures given, for there may be no margin of safety.

Retort Manipulation

The manipulation of the retorts is also extremely important in processing. Before closing the petcocks, all the air must be blown out until nothing but steam escapes. This is essential, since at a given pressure a mixture of air and steam will have a lower temperature than steam alone. It is important to remember that it is the temperature which is destructive to the bacteria or spores, and not the pressure. During the heat processing the can is heated to the same temperature as the steam in the retort, and the liquid in the can vaporises into steam having the same pressure as the steam in the retort. The can, however, does not bulge because the steam pressure on the outside of the can balances the pressure inside. If at the end of the process the retort pressure is rapidly reduced by opening the valves, the can will bulge and the seams become strained. This is due to the sudden removal of the balancing pressure on the outside of the can, and the fact that the pressure inside the can does not drop so rapidly as the retort pressure. Seams strained in this way are liable to let in air or water containing bacteria, with resultant spoilage. In the modern method of pressure cooling, which is designed to obviate seam strain, the pressure in the retort is kept constant after the steam is shut off, by means of compressed air.

Treatment of Cooling Water

The water used for cooling purposes, unless drawn from a municipal supply, may contain a very large bacterial population, particularly if, for economical reasons, it is circulated for re-use. Under such conditions disinfection of the water with chlorine is very desirable, since cans cooled in heavily infected water will show a higher proportion of blowers than those cooled in chlorinated water. Obviously, the chances of bacteria being sucked with water through microscopic leaks in the seams will be greater when the number of bacteria is highest.

Thus it will be seen that during all stages of food preservation, from the preparation of raw materials to the cooling of the processed pack, bacteria may be a source of trouble unless active measures are taken to combat them.

Prevention of Fruit Abscission

THE use of α-naphthylacetic acid in sprays for reducing or preventing fruit-drop has been mentioned previously in these columns, and in America much work on the subject has been undertaken. E. L. Overhalser *et al.* (*Proc. Wash. State Hort. Assoc.*, **36**, 128, *Discussion*, 142) have found that the use of a wetting agent in α-naphthylacetic acid sprays somewhat increases the efficiency, inasmuch as the sprays have a greater effect in reducing fruit-drop of apple trees than when summer oil is used in these sprays. From experiments which they carried out in different parts of the country, they conclude that some benefit on apple colour can be obtained, without injury to the foliage, by spraying with a 0·05 per cent. suspension of α-naphthyl isothiocyanate. The isothiocyanate should be dispersed by mechanical means, using a dispersing agent and not added to the spray as a solution in acetone or benzene as, in this case, there is some injury to the foliage. An addition of sodium thiocyanate to the spray injured the foliage, the extent of the damage increasing with increase in the concentration of the thiocyanate without improving the colour of the apples.

M. Murphy (*Proc. Amer. Hort. Soc.*, 1941, **38**, 123) finds, however, that the action of α-naphthylacetic acid sprays in delaying fruit abscission depends to some extent on the variety of apples concerned. With McIntosh, for example, there was a pronounced delaying effect, but with the Baldwin variety the sprays were unsuccessful. J. V. Enzie and G. W. Schneider (*ibid.*, 99) showed that 0·001 per cent. of the above substance or of naphthyl acetamide was effective in delaying the drop of Stayman Winesap apples, while M. B. Hoffmann (*ibid.*, 97) confirms Murphy's results on McIntosh apples. The fact that these sprays may be effective with one but not another variety of apple, as shown by the work of the last worker, has received confirmation by A. E. Hitchcock and P. W. Zimmerman (*ibid.*, 104) and C. L. Burkholder and M. McCown (*ibid.*, 117). The latter workers find that the sprays materially reduced the drop of Rome and Delicious varieties but not of Jonathan and McIntosh. This last result shows that more work is needed before the method is considered foolproof, and the last-named workers find that if a 0·005 per cent. spray is applied to open flowers there is a decrease in the fruit set and the immature leaves may be seriously injured. This edition of the journal is well worth the close study of those interested in fruit-growing.

The Enrichment of Flour

An American Summary

ENRICHMENT of flour is a new expression. A few years ago specialists in nutrition began to discuss ways and means whereby valuable components of foodstuffs—usually those components present originally in only small amount—might be preserved during processing or in preparation for the table. The word "retention" was used to indicate avoidance of depletion, and "restoration" was used to indicate repair of unavoidable depletion. "Fortification", the oldest term, implied supplementation beyond the natural level. Possible meanings of these various terms have been discussed by several writers in recent issues of *Chemistry and Industry*.

The Position in U.S.A.

A comprehensive discussion of various aspects of enrichments of flour has been prepared by Dr. Alonzo E. Taylor, Director Emeritus of the Food Research Institute (California), and now director of research to General Mills, Inc., of Minneapolis. It has been published under the title, "Why enrichment of flour?" as No. 3 of vol. xviii of *Wheat Studies*. This article gives, more or less textually, some of the principal points, though it has been necessary to omit the description of the distribution of vitamin B_1 in different parts of the wheat berry and in various milling fractions.

In the United States the enrichment of flour with vitamins and salts is so far merely permissive. While it was more than an innovation to have it recognised that the "staff of life" was defective and not really strong enough to be leaned upon, public recognition of this fact has been quickly translated into legislation even before the United States was at war. The urge for action did not arise from public sense of direct need, however; there was no emergency in the food situation; yet it was the atmosphere of national emergency that prompted quick action. The spirit and example of Great Britain led to emulation.

Changes in American Diet

Factually, however, there was need for reform. A century ago half the calories of the American diet (and possibly of other diets) were in the form of vitamin B_1-rich grains; also, comparatively little sugar was consumed, while pork, an eminently vitamin B_1-rich meat, was consumed much more extensively than at present. Nowadays, possibly half the calories of the diet are in the form of grains *and sugar* together; and the drop in total vitamin intake is probably considerable.

Figures for average per capita consumption of food are hard to come by in many instances and, when obtained, are likely to be misleading. An average figure derived from production divided by population represents in practice an unattainable maximum. There is loss in harvesting, storage, and processing; there are further losses during home preparation, such as cooking of flour mixtures and toasting of bread. If we were to try to measure resorption instead of intake or ingestion, the errors would be still larger.

Also, if we wish to use total food supply to measure nutrition, without being misled in important particulars, we must also use public health data of various kinds and of various degrees of reliability. We face the dilemma of deciding whether to judge the state of nutrition by the food supply, or to judge the food supply by the state of nutrition—or by our impression of the latter.

The proposal to have foods enriched when only one component is removed by processing has more far-reaching ramifications than is appreciated at first thought. Thus, in the canning of fruits and fruit juices, it is sought to save vitamin C. This involves expense. It might easily be true of a particular product that it were better to lose the vitamin in the processing, and to add it at the end. What needs clearly to be realised is that the point of occurrence of high vitamin content need not be identical with the point of occurrence of ripening, with which processor and consumer are familiar. There are considerable losses in processing and packing pork meats. The makers of sausage might add vitamin B_1 to bring the product up to the natural high level.

Analyses of Canadian-American Wheats

Recently completed analyses of pure varieties of wheats of the Canadian-American crop of 1940, made with uniform methods standardised for cereals, indicated variations (micrograms per lb.) in vitamin B_1 of from 1,500 to 2,900, in riboflavin of from 400 to 600, in nicotinic acid of from 21,000 to 35,000, and in iron of from 11,000 to 28,000. The United States Food and Drug Administration has adopted rather arbitrary figures for minimal and maximal contents. The permitted minimum of 1,660 micrograms of thiamin per lb. of flour, and the maximum of 2,500, correspond to a range of 35 to 52 international units in the old nomenclature. For hard bread-flour wheats 35 is too low, and even 52 does not include higher known values for some hard bread-wheats. Hence no penalty should be admissible if the vitamin B_1 content of flour exceeds the permitted maximum: the minimum should be rigid, but the maximum should be flexible. Enrichment of soft-wheat flour will require heavier addition of vitamin B_1 than enrichment of hard-wheat flour. In any event there is little purpose in attempting to have enriched short-patent flour corresponding in vitamin B_1 content with a predicated whole-wheat level.

British Intake of Flour

It is believed that when the enriched war flour of Great Britain is averaged to take account of the different kinds of wheat included, the vitamin B_1 content will approximate to that aimed at in Canada—namely, 1,200 micrograms per lb. It seems likely that the present British daily intake of flour per person is

not less than 12 oz., corresponding to a daily average intake from flour of some 900 micrograms of vitamin B_1.

This average figure represents an actual range of final vitamin B_1 content of enriched white flour in Great Britain of from 1,100 to 1,500 micrograms per lb., and the intake per person may be expected to range from 700 to 1,000 micrograms per day if each person consumes about 10 oz. Considering vitamin B_1 losses in other elements of the British war diet, especially through contraction of pork consumption, these figures are low compared with accepted U.S. standards. In technical circles in Canada the unofficial but accepted estimate of daily requirement of vitamin B_1 per capita is 1,000 micrograms, which is much lower than the figure adopted by the Food and Nutrition Committee of the United States National Research Council.

It seems important to retain or supplement the vitamins in other foodstuffs—especially meats and milk—in order to lighten the vitamin burden of cereal grains.

Has the great eel experiment failed?

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—Where are the eels the Government publicists assured us would be forthcoming in abundance from our English rivers in the early stages of the war? A great eel experiment was to have been developed on a national scale so that we could build up a valuable food reserve from the richest of fish, just as Italy and other Continental countries did long ago. Truly a number of eels were sent from Lakeland to a canning firm and very good packs were made from them, but there has been no significant contribution of eels to the national menu. I have tried in vain for over a year to obtain a tin of eels in one of our biggest cities: indeed, I have found it much more profitable to go sniggling for eels in the local rivers by lobbing a worm on a hook, and in the record frost of 1940 the local lakes yielded eels a yard long.

In fairness to the proposers of the great English eel fishery, one must admit that the fishmonger's slab has carried more eels than usual, but surely that was the result of his own effort to offset the great dearth of salt fish? In Cumberland, where the eel-traps were put down early in the war, the results were not very encouraging. Was the reason for this that the wrong sort of trap was used? I knew a very good eel river near my place, where eels up to a yard long and nearly as thick as your arm, could be caught at one time, but it will no longer yield an eel or any other fish because it has been polluted. The pollution of good fishing waters by careless wartime disposal of factory waste, camp and domestic sewage and rubbish is the same sad tale that became evident in the last war. There has been no official strong line in the preservation of freshwater fisheries, although some of the river boards have defended the salmon rivers. After the great publicity at the end of 1939, that we should have to look to our freshwaters as a reserve food supply with eels and other things, we have failed to find any vigorous effort to develop them despite the scarcity and excessive cost of fish. The canning of perch from Windermere owes its success to the Freshwater Biological Association which is stationed there, but there does not seem to have been any speedy expansion of the industry to exploit other big waters swarming with perch, like Malham Tarn in Yorkshire for instance, although at long last it is stated to be extended to Derwentwater. A very good Lancashire fishing water at Knowsley Delph, which began the war with rainbow trout and many more edible fish, was suddenly obliterated by the official tipping of Merseyside air raid rubble into the lake, which in itself claimed preservation as a beauty spot when so many alternative sites were available in the ugly, disused mining hollows a few miles away at St. Helens.

I thought that good use could have been made of the hundreds of amateur aquaria clubs and the thousands of angling clubs existing early in the war, in order to obtain local information about the best haunts of eels and the most profitable local methods of catching them. The authorities evidently thought otherwise because the people most intimately in contact with our freshwater fish were not sought after, and now it is too late because most of them have been called up and half their angling clubs have gone out of existence for lack of subscriptions, so that they are no longer preserving the local fishing waters which become the rubbish tip of anyone with waste or offal to discard. Hence the shortage of fish on Friday, or any other day.

After the enemy had developed a source of vitamin C from rose hips, the Ministry of Food did the same here. After Germany established an eel-fishing depot at Epney, and Italy had a big fishery, official efforts were made here. One would appreciate more enterprise, or perhaps more encouragement for initiative and enterprise, than the routine and hide-bound traditional methods of our civil service permit. The catching of elvers that run up the Severn and the Dee in great numbers can be performed with a suitable net and conveniently emptied into buckets at hand. Germany restocked her rivers with elvers from our River Severn, and she is now feeding on the fat of them! If we had restocked all our suitable waters with elvers early in the war we should now be reaping some of the harvest.

Personally I feel that the great eel experiment has not failed, because it has not been given a proper trial. We continue to waste our freshwater fish because there is no organised system to preserve sufficient breeding stocks for the future. Freshwater fish cannot be regarded as a quick food reserve. They must be considered from a long-term angle, providing a small but steady contribution to the food resources, so long as their breeding stocks and breeding waters are preserved—and no longer. We lack sufficient clean waters in this industrialised country to regard our freshwater fish as a bottomless store of food. But there are sufficient of them to help us a long way along the rugged road of war. We hope to be able to buy more tinned eels, eel soups, and other dishes before the war is over!

Yours, etc.

BIOLOGIST.

Fruit and Vegetable Protection

FLORIDA'S Experiment Station has found a new synthetic wrapper which performs miracles of fruit and vegetable protection by means of Pliofilm, which is defined as rubber hydrochloride, a complex organic compound obtained by the reaction of hydrochloric acid with latex rubber, and is the trade name used to identify a moisture-proof transparent sheet made from the compound.

Investigation of the substance began several years ago when Dr. A. L. Stahl recognised the unusual possibilities in its use as a fruit and vegetable wrapper. This work was done in the Horticultural Laboratories of the Florida Agricultural Experiment Station at Gainsville, of which Dr. Wilmon Newell is director. The investigation of Pliofilm by Dr. Stahl develops from his exhaustive investigation into fruit wrappers and their respective efficiencies on Florida fruits and vegetables. The results of that work will soon be ready for publication as a formal report by the Experiment Station.

Commercial Value

The commercial value of Pliofilm to the Florida Citrus industry rests upon a peculiar physical property of rubber itself. For some unknown reason rubber will hold under compression all common gases except carbon dioxide. Pliofilm and almost all other rubber products retain that individual characteristic. This novel property of the product has very definite significance in agriculture. Citrus fruit, for example, is alive when picked, and retains some life as long as it is edible. While it has life it " breathes "—it gives off carbon dioxide.

Pliofilm permits the fruit to exhale its carbon dioxide. Because of its glittering transparency it puts an apparent polish on the fruit far beyond any heretofore obtained. And it holds the moisture loss from fruit to less than 1 per cent. over several months' storage, as compared with a ten times greater loss under identical conditions of temperature and humidity for fruit wrapped in the ordinary tissue paper. In the case of green vegetables, Dr. Stahl found that Pliofilm has an added value, in that it preserves the green colour and field-fresh appearance of lettuce, celery, cabbage, cucumbers, broccoli, brussels sprouts and other like produce.

Stretch-Wrappings

The results of the investigation were so promising that a research grant was established at the University for further investigation of the value of Pliofilm to Florida agriculture, and its commercial application as a wrapper for the citrus industry. After reducing the thickness of the sheets from 40 gauge to 20 gauge, they found that still further savings of material could be obtained by " stretch-wrapping " the fruit. This method does away with the use of the Pliofilm sheet-wrapper used much as the tissue paper wrapper with the twist, and saves the material lost in the twist. The method takes advantage of still another property of the product —the stretching characteristic. Pliofilm, if heated, will receive a fruit thrust into the film and lies around it skin tight, being sealed with the slight twist. The hand operated laboratory model of the stretch-wrap machine, which had been developed originally for experiments in stretch-wrapping soap, roller bearings and other inorganic products was used. Commercially the stretch-wrap use of Pliofilm has many advantages. The skin is on to stay—there is no twist to loosen between the time the fruit is wrapped and the time the consumer breaks the seal to eat the fruit. The stretch-wrap process reduces the cost of material because it uses far less material. Finally the principles of the machines already developed to stretch-wrap Pliofilm around candy bars, etc., can be adapted to wrap citrus fruit at speeds up to 500 individual fruit per minute.

Comparative Costs

The question naturally arises as to whether this wrap is worth this slightly higher cost as compared with paper wrapping. If used universally in any one house it would tend to eliminate the necessity for waxing fruit. It would hold the tree-fresh quality of the fruit moving into fresh fruit channels for periods many times longer than the time now allowed for fruit to reach the consumer in an acceptably fresh condition. In other words, greater time for proper distribution would be permitted in the regular handling and sale of fruit without endangering its freshness, quality and appearance. By the same token it would permit an expansion of the marketing territory as time in transit could be extended well beyond the present marketing limits.

The Pliofilm wrapper has been found to control the spread of moulds and stem-end rots from one fruit to another, thus nesting is eliminated. Also, the fruit is less vulnerable to disease, since the wrapper permits it to be kept in a better physiological condition. These features would allow the fruit to be carried through trade channels to the consumer with much less decay and with a corresponding elimination of discounts more than enough to pay the extra cost of the products' use. Pliofilm has been found to preserve vitamin C in direct proportion to the amount it preserves the freshness of the fruit.

"Food Manufacture" 1941 Index

As it will not be possible to bind the January and February numbers of FOOD MANUFACTURE with the rest of the 1942 volume owing to the change of size starting with the March number, the index for 1941 will include the January and February numbers. It is suggested that those who wish to bind FOOD MANUFACTURE will include these numbers in the 1941 volume. Copies are now available to subscribers on receipt of a stamped addressed envelope, preferably of a size which will permit of the index to be sent without folding.

Ministry of Food

Latest Statutary Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, February 1, page 42.

No.	*Date.* 1941.	PRICE FIXATION ORDERS
1935	Dec. 1.	Amending the Eggs (Control and Prices) (No. 3) Order, 1941. (1d.)
1953	,, 3.	Amending the Hares (Maximum Prices) Order, 1941. (1d.)
1972	,, 6.	Amending the Oats (Control and Maximum Prices) (Northern Ireland) Order, 1941. (1d.)
1994	,, 10.	The Soya Flour (Control and Maximum Prices) Order, 1941. (1d.)
2005	,, 11.	The Sugar (Maximum Prices) Order, 1941. (2d.)
2006	,, 11.	Amending the Rabbits (Control and Maximum Prices) Order, 1941, and prescribing an Appointed Day for the purposes of Article 10 of that Order. (1d.)
2007	,, 11.	Amending the Poultry (Maximum Prices) (No. 2) Order, 1941, and prescribing an Appointed Day for the purposes of Article 7 of that Order. (1d.)
2021	,, 15.	The Canned Meat and Canned Soup (Control and Maximum Prices) Order, 1941. (2d.)
2039	,, 17.	Amending the Eggs (Control and Prices) (No. 3) Order, 1941. (1d.)
2075	,, 20.	Amending the Dried Fruits (Maximum Prices) Order, 1940. (1d.)
2085	,, 23.	Amending the Home-Grown Wheat (Control and Prices) Order, 1941. (1d.)
2125	,, 27.	Amending the Home-Grown Tomatoes (Maximum Prices) Order, 1941. (1d.)
2129	,, 30.	The Saccharin (Control and Maximum Prices) Order, 1941. (1d.)
2139	,, 31.	The Dried Peas, Beans and Lentils (Control and Maximum Prices) Order, 1941. (2d.)
2140	,, 31.	The Oat Products (Control and Maximum Prices) Order, 1941. (2d.)
	1942.	
4	Jan. 3.	The Fish (Maximum Prices) Order, 1942. (3d.)
5	,, 3.	General Licence under the Oat Products (Control and Maximum Prices) (No. 2) Order, 1941. (1d.)
6	,, 3.	Amending the Feeding Stuffs (Maximum Prices) Order, 1941. (2d.)
21	,, 7.	Amending the Rabbits (Control and Maximum Prices) Order, 1941. (1d.)
	1941.	FISH
2040	Dec. 17.	Amending the Canned Fish (Control) Order, 1941. (1d.)

No.	*Date.* 1941.	FEEDING STUFFS
1952	Dec. 2.	General Licence under the Compound and Mixed Feeding Stuffs (Control) (No. 2) Order, 1940. (1d.)
2063	,, 18.	General Licence under the Feeding Stuffs (Licensing and Control) Order, 1941, the Feeding Stuffs (Control) (Northern Ireland) Order, 1941, and the Milled Wheaten Substances (Restriction) Order, 1940; and Directions under Regulation 55 of the Defence (General) Regulations, 1939. (1d.)
		GENERAL
1958	Dec. 4.	Prescribing an Appointed Day for the purposes of the Food (Restriction on Dealings) Order, 1941. (1d.)
1971	,, 6.	Directions under the Food Transport Order, 1941. (1d.)
1992	,, 10.	Amending the Rationing Order, 1939, and giving Directions thereunder and amending the Cheese (Rationing) Order, 1941. (1d.)
1993	,, 10.	The Infestation Order, 1941. (1d.)
2022	,, 15.	General Licence under the Food (Restrictions on Dealings) Order, 1941. (1d.)
2025	,, 16.	Amending the Food (Restrictions on Dealings) Order, 1941. (1d.)
		MILK AND MILK PRODUCTS
1936	Dec. 1.	Amending the Milk (Retail Prices) Order, 1940. (1d.)
2100	,, 24.	Directions under the Condensed Milk (Distribution) Order, 1940. (1d.)
2126	,, 27.	The Milk (Diversion) Order, 1941. (1d.)
		POINTS RATIONING
2015	Dec. 13.	Amending the Food (Points Rationing) Order, 1941. (1d.)
2026	,, 16.	General Licence under the Food (Points Rationing) Order, 1941. (1d.)
2130	,, 30.	General Licence under the Food (Points Rationing) Order, 1941. (1d.)
2138	,, 31.	Amending the Food (Points Rationing) Order, 1941. (1d.)
		VEGETABLES
1965	Dec. 4.	General Licence under the Home-Grown Carrots (1941 Crop) (Control) Order, 1941. (1d.)

News from the Industry

"Cash and Carry" Meals

The Right Hon. David Lloyd George, O.M., M.P., is one of the first farmers in the country to make use of one of the large number of Ford Emergency Food Vans now in service all over Britain.

He recently arranged with the Haslemere Urban District Council for one of the vans allocated to the district to call at his farm at Churt.

The Council prepare the meals at a British Restaurant they have established at Haslemere, and transport it in Ford Emergency Food Vans to the neighbouring rural areas. The service is available to all agricultural workers in the district.

Major the Right Hon. Gwilym Lloyd George, M.P., Parliamentary Secretary to the Ministry of Food, performed the inauguration of this rural "cash and carry" meals service, which the Ministry of Food is encouraging local authorities to establish in all of Britain's farming districts.

* * *

Tinned Meat Prices

The Minister of Food has made an order increasing the maximum retail price of American chopped luncheon tongue from 2s. 4d. to 2s. 8d. a pound, which may be increased to 3s. 4d. a pound if sold sliced in quantities of more than 1 pound.

The order also increases the price of American luncheon meat from 2s. to 2s. 6d. a pound if sold in quantities of not more than 1 pound. These increases are to cover the retailer against loss of saleable meat on removal from the tin owing to jelly and juices being lost on slicing.

* * *

Vegetable Margarine

Persons who for religious or other reasons do not eat animal lard and bacon and wish to obtain vegetable margarine in place of animal lard cooking fats, are reminded that they should apply to their local Food Office and produce their ration books for the necessary adjustment.

Ministry of Food Appointment

Mr. Hugh E. Roberts, Llaniestyn, near Pwllheli, has been appointed assistant deputy director of the animal feeding stuffs department at the Ministry of Food, Colwyn Bay. For nine years he was organiser to the Welsh Agricultural Organisations' Society of the economic department, Aberystwyth University.

* * *

Coffee Stocks

To secure an equitable distribution of coffee supplies and to ascertain stocks, every person who on February 28 had more than a ton of raw coffee must, by a Ministry of Food Order, make a return of his stocks specifying the net weight and country of origin and indicating whether it is in bond or duty paid.

* * *

British Food Mission in North America

Negotiations by the Ministry of Food for the procurement of food supplies for the United Kingdom and other British countries from the North American Continent have hitherto been conducted directly from the United Kingdom in the case of Canadian supplies and through the agency of the British Food Mission to the U.S.A. in the case of U.S.A. supplies. It has been found desirable to co-ordinate the administrative arrangements for the procurement of food supplies for both Canada and U.S.A.

The British Food Mission in North America has established in Ottawa a Canadian office in charge of Mr. G. H. S. Pinsent, financial adviser to the British Embassy in Washington. The office will operate under the general direction of Mr. R. H. Brand, head of the mission in Washington, and will aim at co-ordinating the procurement of food supplies for Great Britain from the United States and Canada.

Canners' Wartime Association

The British food canning industry has formed a Canners' (Wartime) Association. The constitution and rules have been prepared and approved by a fully representative meeting of canners, and an executive committee has been elected.

Copies of the constitution and rules are prepared for circulation. All canners at present holding a licence from the Ministry of Food will be supplied with a copy and an application form for membership at an early date by post.

Canners not holding a licence from the Ministry of Food must apply in writing to the Director of Canning, Portman Court, Portman Square, London, W.1, for copies of the constitution and rules and a form of application for membership. Licences will only be granted by the Ministry of Food to those firms who are in membership with the Canners' (Wartime) Association.

* * *

British Food Mission, Washington

The Ministry of Food announces that Mr. J. S. McLean has resigned his appointment as Principal Trade Adviser to the British Food Mission at Washington. Lord Woolton has accepted Mr. McLean's resignation with regret and expressed his appreciation of the assistance which he has given to the Mission.

* * *

Mr. Frank Turner

Mr. Frank Turner retired from the firm of Dewey and Almy, Ltd., the world-famous specialists in rubber and latex materials, on March 15, after fifteen years' service.

Before this company operated directly in Britain, their agency was held by the E. W. Bliss Company and run by Mr. Turner. He served with this company for fourteen years.

Mr. Turner's plans for the future are, we understand, not yet settled.

Humidification of Factories

However favourable the climate may be, physical conditions vary in food factories to a considerable degree in wet and dry weather between summer and winter conditions and early morning and midday.

The best and most successful method of air conditioning is that associated with the vaporisation of water from a given source.

The ideal air humidifying device is that one which delivers air so completely mixed with water that it can be projected into the room without risk of droplets falling on to the machinery or material. The "Aromist" humidifier, of Germstroyd Products, Limited, is designed to inject into the atmosphere the degree of moisture required to maintain in a room the humidity necessary to ensure the best working conditions for the material and the health of the operatives. It is original in design, is claimed to be different from all other machines introduced for this purpose, and represents a new conception of humidifying practice.

* * *

A New Solder to Save Tin

A solder has been produced that compares favourably with normal solders for many duties and which is particularly suitable for bit soldering on tinplate. The new solder actually effects a saving that can go far to overcome the difficulties created by shortage of tin. It is a lead base alloy containing only 5 per cent. tin, with other constituents which improve the fluidity and strength, is designated T.M.5., and an application for a patent on the formula has already been made by Fry's Metal Foundries, Ltd. Extensive tests in the laboratory have established its properties. In comparison with the standard alloys, T.M.5 shows two features which must be taken into account when its application is considered:

(1) The melting point is higher —540° F. as against 446° F. for Grade "C" solder (40 per cent. tin), and 401° F. for Grade "B" solder (50 per cent. tin).

(2) The "alloying power" is lower, on account of the reduced tin content.

The influence of these two features varies with the method of soldering that is employed, and, except where machine soldering is concerned, and further research work required, difficulties can be surmounted.

The strength of joints made with the solder is good, especially on steel.

Only when it is essential to use a low melting point solder—for example, the spot soldering of electrical joints or any operation where the characteristics of the eutectic are required—is it necessary to continue the use of the high tin content solder. Despite its remarkable qualities, T.M.5 cannot be expected to replace entirely the established alloys with a high tin content, but it can make a big contribution to the urgent need for tin economy.

* * *

Egg Preservative

In the "Oteg" dry-sealing process is used a scientific preparation which has been on the market for many years.

The eggs are simply dipped in and out of the thin liquid, allowed to lie for half an hour for the thin invisible film to set in the pores of the shell and seal them up. They can then be stored and treated just like ordinary new laid eggs. They boil, poach, or fry, and at eight to ten months old, if they are new laid when they are dipped, it is difficult to distinguish them in any way from new laid eggs.

Eggs preserved as above can be packed and sent by parcel post, or conveyed just like ordinary eggs, provided care is taken that they are not cracked, as a crack breaks the sealing compound. The manufacturers are Sozol (1924), Ltd.

* * *

Everest Egg Substitute

Marshall's Malted Milk, Ltd., wish to draw attention to the fact that the above product under *Licence No. L/1* is manufactured by them and bears their guarantee.

The recent prosecution at Leeds under the name "Everest Egg Substitute Powder" has no connection whatsoever with Marshall's product.

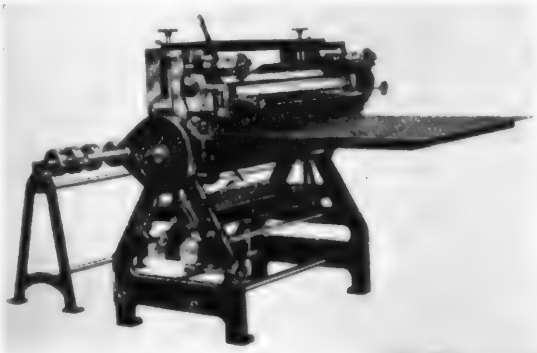
* * *

A New Coating Machine

A new item of equipment which applies lacquer, paint, varnish, enamel and other similar coatings to various sheet materials at a speed of 1,500 to 3,600 sheets per hour is the "Rutherford" Micro-Set Coating Machine (illustrated here), made by Dawson, Payne and Elliott, Ltd.

This machine was only introduced a few months prior to the outbreak of hostilities and consequently has not been put into extensive operation like the earlier machines; the new machine embodies many improvements on these.

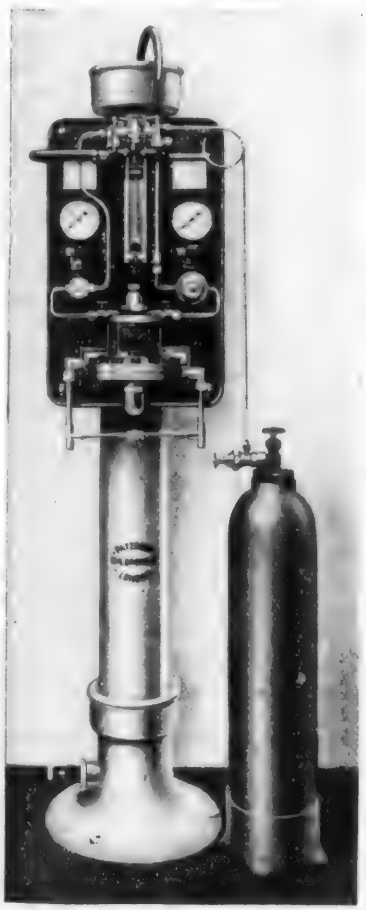
Notable features are: Chilled iron impression roller hollow for water cooling and provided with flexible stuffing boxes. Trip lever to throw fountain and feed rollers out of contact with coating roller. Fountain and feed rollers fitted with dials graduated in thousandths. These rollers may be set independently. Hand-wheel and locking nut for adjusting scraper blade. Hand-wheel to tip drip-pan for easy cleaning and removal.



Sterilisation of Water Supply

In connection with the practice of sterilising washing water in the canning, bottling and other food industries by means of chlorine gas, including cooling water at power stations, to prevent organic growths on condenser tubes, generally using 0·5 to 1·0 part per 1,000,000, two of the latest methods are dual control and automatic control.

These are well illustrated by the "Chloronome" equipment of the Paterson Engineering Co., Ltd. This is available in three general types—the "Pulser", capable of adding up to 10 lbs. of chlorine per 24 hours; the "Manometer", dealing with any amount of chlorine over 10 lbs. per 24 hours; and the "Automatic", which controls the rate of chlorine addition to the water automatically in direct ratio to the main flow passing through a Centuri tube.



The general principle of all the instruments is that the chlorine is passed out of the cylinder into an integral, vertical, narrow diameter, closed earthenware absorption tank, forming a solution of chlorine, which is then discharged to the bulk water supply so as to give rapid and uniform distribution of the chlorine, the solution being added either by gravity or by means of a small centrifugal pump (pressure feed) with integral electric motor.

Dual control consists in using two separate instruments on the same board, one of which is capable of dealing with the full load, the other being a standby, so as to eliminate almost completely any possibility of stoppage of sterilisation, even for an extremely short period. Because of air raids also and the possibility of fracture of water mains, with interruption in supply, the firm's well-known work in the field of portable chlorinating equipment is now of great importance, alike as regards completely self-contained mobile units on trailers hauled by motor vehicles or other convenient manner, or portable sets of various sizes carried by hand.

* * *

Fighting Incendiary Bombs

The thermite incendiary bomb can be estinguished by two methods—that is, the use of sand or earth, preferably using a small sandbag, and by water applied in the form of a spray, of which an example is the stirrup pump.

Because of the heroism of a vast army of fire-spotters hundreds of thousands of thermite incendiary bombs have already been extinguished by these methods, and millions of pounds worth of property saved. Still more effective results, however, can be obtained by using the latest types of portable extinguisher, which gives a very high pressure finely atomised jet of water and carbon dioxide gas, as represented by the "R.S.Q." extinguisher of the Nuswift Engineering Co., Ltd. This is a cylinder of 2 gallons capacity, having a 42-inch length of flexible hose and a nozzle, brought into operation by a slight blow upon a knob, when there is given instantaneously a jet 30 feet in length much more powerful than that of the stirrup pump, which it will be remembered also takes three people to work it. Normally, therefore, a man or a woman with one of these extinguishers is more effective than three people with a stirrup pump.

* * *

Colours Control Temperature

Coloured products enable permanent and definite indication of the temperature reached on a heated surface to be obtained by means of a sharp, clear-cut change of colour.

They are made in the form of a paint suitable for direct application to practically any surface, by brushing or spraying, and dry quickly at room temperature. When the temperature of the treated surface is then raised, the original colour of the pigment changes sharply at a definite point, and the new colour persists after the surface has cooled down. A large range of these colours covering many temperatures is available, and it will thus be seen that the measurement of temperature and of temperature distribution on heated surfaces is greatly facilitated.

While the change of colour is dependent mainly on the temperature attained, the length of time to which the colour is exposed to that temperature also has some effect, and all the colours have been standardised on an exposure period of ten minutes, and the temperatures shown are those which produce the colour change within this interval. If, for instance, a colour which indicates a change at 200° C. is heated for a longer period than ten minutes at a few degrees less than 200° C. the colour change may take place at this slightly lower temperature. In general, the variation is less than 5° C. Where it is necessary to depart considerably from the standard time of exposure, it is not difficult to calibrate the colour to meet these special conditions, and this procedure is recommended for accurate work.

Thermindex Colours are manufactured by Synthetic and Industrial Finishes, Ltd., and sold exclusively by J. M. Steel and Co., Ltd.

The Light-Ray in Industry

The harnessing of light by photo-electric apparatus for industrial purposes is one of the most interesting of modern achievements. In this field the Radiovisor Parent, Ltd., have devoted its entire energies to the development of light-ray methods for controlling mechanical operations. Space only permits of mention of but a few of the applications of light-ray control, but the examples will serve to indicate the scope of the system.

A lighting control unit, consisting of a light-ray cell and an electrical circuit, automatically switches lights on and off, at dusk and dawn, in fog or in premature darkness, irrespective of the hour. It has been widely used for the control of street lighting, traffic signals, offices, factories, etc.

Among its applications in the food industry is the counting of loaves of bread, sacks, packets, tins passing along conveyors.

The apparatus is in successful operation in power stations. It automatically indicates, by light-ray methods, degrees of smoke density in the flue, stack or uptakes, thus assisting smoke abatement and aiding in the obtainment of efficient combustion and plant economy. It is also used for the detection of ammonia leakage in air-conditioning plants.

In the manufacturing processes of some industries, such as brewing, for example, it is important to detect at once any change in the density of liquids. A Radiovisor turbidity indicator serves as an automatic and instantaneous check on such change. Similarly, variations in turbidity arising in water treatment processes can be indicated.

* * *

One of the Old Brigade

Mr. Wm. Knight, of Cumming Parsons, Ltd., probably one of the oldest essence travellers in the country, has been laid up for some months, and as he is in his eightieth year it is doubtful whether he will be able to travel very far from his native city, Glasgow, in the future.

No doubt his many friends in Scotland and the north of England will be glad to hear that he is recovering slowly, although still confined to bed.

The Brush Electrical Engineering Co., Ltd.

Important changes have taken place in the board of the Brush Electrical Engineering Co., Ltd., and subsidiary companies.

Mr. T. B. Keep, M.I.Mech.E., has retired from the board, but is remaining on the boards of two subsidiary companies—viz., Brush Coachwork, Ltd., and Petters, Ltd.—where his wide experience continues to be available in a consultative capacity.

Mr. Alan P. Good, deputy-chairman, has been appointed managing director of the company in succession to Mr. Keep.

Mr. M. A. Fiennes has joined the board as an executive director. Mr. Fiennes served his apprenticeship at Ransomes and Rapier, Ltd., was subsequently manager, pneumatic tool and air compressor department at Armstrong Whitworth, Ltd., and immediately prior to his joining the Brush board was responsible for the armament production of United Steel Companies, Ltd.

Mr. W. M. Good, A.C.A., has been appointed managing director of Brush Coachwork, Ltd., a subsidiary. Mr. W. M. Good was previously general manager of the projectile division of Wyndham Hewitt, Ltd., and, prior to that, general manager of Essex Aero, Ltd.

* * *

New Seaming Machine

Some features of a new semi-automatic seaming machine relate to range and adjustment. A very rapid adjustment is obtained over a large range of diameters and depths—viz., diameters from 1½ ins. to 6 ins., depths from 1½ ins. to 24 ins. Quick change is possible to any size with these ranges—five to seven minutes only. The drive is self-contained and all movements of the machine are entirely automatic and continuous. The output is controlled by a simple adjustment to any speed from 25 to 40 containers per minute. Another item is an automatic lid-curling machine for the pre-curling of container tops and bottoms, curling of lever bungs, slip lids, etc. The equipment is made by Perkin and Co., Ltd.

OBITUARY

Sir Joseph Reed

Sir Joseph Reed, a former chairman of the Press Association and a former managing director of the *Newcastle Chronicle*, died on March 2 at the age of 75.

He was intimately associated with the founding of *Chemical Industries*, and was the first chairman of the editorial committee.

Knighted in 1922, he had been instrumental in raising the Tyneside Scottish Brigade in the last war and was honorary colonel of the battalion of which the Chairman of FOOD MANUFACTURE was adjutant.

* * *

Sir William Bragg

The passing of Sir William Bragg, O.M., on March 12, at the age of 79, deprived this country of one of her most distinguished scientists. After getting his degree at Trinity College, Cambridge, he occupied the Chair of Physics and Mathematics at Adelaide University for twenty-two years.

In 1909 Bragg succeeded Stroud in the Cavendish Chair at Leeds University. In 1913 he joined his son, Lawrence Bragg, in establishing the main facts of X-ray spectroscopy, and founded the new science of X-ray analysis of crystal structure. In 1915 W. H. Bragg and W. L. Bragg were jointly awarded the Nobel Prize.

During the last war Bragg was concerned with submarine detection. In 1920 he was made a K.B.E., and in 1931 he received the O.M. He had been appointed Quain Professor of Physics at University College, London, in 1915, and continued to work there on crystal analysis after the war.

Among other appointments were Director of the Royal Institution in 1923, Fullerian Professor of Chemistry, Royal Institution, and Director of the Davy-Faraday Laboratory. In 1935 he was President of the Royal Society.

Information and Advice

Soup Manufacture

7,609. *I am employed in a food factory and for some time have been experimenting with soup canning and have met with little success. I have made some vegetable soups according to recipes, and after tinning—a few days—these lose all their vegetable flavour and have instead a harsh, acid taste. Some have gone completely sour. I have also tried simply blanching the vegetables and pouring over a boiling stock before capping, but with still the same result. I have tried retorting at different temperatures* (240° F.—250° F.) *for varying lengths of time* (30 *mins.*—80 *mins.*).

Soups containing lentils when made in a small batch keep their flavour well and are palatable, but when made in a large batch either go sour or leave a decidedly singed impression.

In all cases there is absolutely nothing wrong with the flavour or quality of the soup before being tinned and retorted.

I would be obliged if you could suggest any reasons for my lack of success. (Glasgow.)

From the account of your troubles we have tried to visualise what is happening. It would appear that as you say in all cases there is absolutely nothing wrong with the flavour or quality of the soup before being tinned, and that it is after standing a few days that the soup goes sour, there must be something radically wrong with your sterilisation, although the 80 mins. at 250° F. should have been ample. I can only suggest that you should see whether your retort thermometer is correct, and that you are really getting the temperatures in the retort that you think you are.

You should also find out whether your tins are properly closed, as everything points either to insufficient sterilisation or leaky cans.

With regard to the soup containing lentils, you say that when made in a small batch, they keep their flavour, but when made in a larger batch, go sour. This, of course, means that you have not duplicated conditions, and it is possible that at some time or other during making the large batch, the temperature has gone down, and fermentation produced.

That is all we can suggest from the information given in your letter. We do not think that your trouble arises from any fault in the recipes, although we have not seen these, but in the handling of your materials.

Fish Pastes

7,153. In the March issue of FOOD MANUFACTURE were recorded some basic recipes for fish pastes given to a Vancouver reader.

Such basic recipes must, of course, be adapted to existing regulations with respect to controlled materials. So far as this country is concerned, according to Statutory Rules and Orders No. 2021, the minimum fish content for fish pastes is 40 per cent. and the maximum 60 per cent.

Information Supplied

7,444. *Would you kindly let us have makers of machines for mixing fruit juices?* (London.)

This was done.

7,419. *I have a customer who is interested in the treatment of bones by steam to reduce them to a soft pulp. It was suggested that I wrote to you for details of the necessary equipment, and names of the manufacturers of machinery.* (Stratford-on-Avon.)

Details of plant and names of suppliers were given.

7,442. *I shall be pleased to hear whether you can give me any information how puffed wheat is made; also the names of firms capable of supplying the necessary machinery to produce this article.* (Liverpool.)

The name of an expert was given.

7,473. *We shall be obliged if you will be good enough to put us in touch with manufacturers of steam pressure cookers. These are required for the purpose of steaming vegetables, which are afterwards dried and used in the production of our vegetable soups.* (Herts.)

Some names were given.

7,479. *We wish to buy waxed woodpulp or similar waxed discs 2⅞ inches in diameter. Do you know of any firm able to supply this particular size from stock?*

Also we require some cellulose ribbon about 2½ inches in width which can be made to adhere to itself by pressing with a hot, shaped iron to form little envelopes. Can you give us the address of suppliers of this material? Do you know of any patent we might be infringing by using this method for packing small quantities of tablets? (Kent.)

With regard to the first query, the name of a firm who would supply from stock was given. Some suggestions of possible concerns that might help with the second query were given.

7,480. *We contemplate manufacturing macaroni, noodles, vermicelli, etc. Are you able to furnish us with literature, recipes and methods, or to put us in touch with experts, machine manufacturers, etc.?* (London.)

All this was done.

7,490. *I shall be glad to know if you can advise me where to buy potato flour or starch?* (Derby.)

We do not know of any manufacturers of potato starch in this country, but the name of a manufacturer of potato flour was given.

Information Required

8,048. *We are experiencing difficulties in cleaning out compressed cereal mixture from steel and bronze dies. Will you kindly let us know if there is any alternative method to that of punching to clear the holes?* (York.)

8,024. *Will you please inform us what is the process for scalding pigs with alum?*

We gather that an addition of alum in a second tub of boiling water softens the rind better than any other process, and we would be glad to know the method of the process. (Port Dinorwic.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

An Improved Method of Preserving Meat

An improved method by which meat can be preserved by pickling.

Meat is preserved by impregnating same with a pickling liquid in two stages—the first stage consisting in immersing the meat in a pickling liquid in a vessel and thereafter extracting the air therefrom so that the meat is then subjected to reduced pressure, and, after one or more hours of this treatment, the meat is subjected to the second stage, which consists in immersing the meat in a pickling liquid at atmospheric pressure for several days.

The invention further comprises a method of preserving meat as set forth in the preceding paragraph, wherein the meat, prior to being subjected to treatment in a pickling liquid under reduced pressure, is steeped in a pickling liquid for a few days.

Preferably in carrying the invention into effect the meat, which may be in the form of a carcass or in the form of one or more pieces, is placed in a vessel containing sufficient quantity of pickling liquid to immerse the meat. The pickling liquid may be brine. The meat is allowed to steep in the pickling liquid for, say, three or four days.

The meat is then transferred to another vessel containing pickling liquid and this vessel is connected to a pump by which the air is extracted therefrom, the pressure in the vessel being thereby reduced as far as is conveniently practical.

The meat is left in the vessel for four or five hours, the reduced pressure being maintained during this period.

Thereafter the meat is extracted from the vessel and inserted in another vessel containing brine, in which the meat is immersed. The interior of this second vessel is maintained at atmospheric pressure.

After the meat has been left in the second vessel for about four or five days it is withdrawn therefrom, the process being now completed.

By the aforesaid process the impregnation of the meat is effected solely by immersing the meat in the pickling liquid, first at atmospheric pressure, then at reduced pressure, and then at atmospheric pressure, no mechanical means being employed to force the pickling liquid into the meat.

541,119. Berka Heller.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

541,528. McDOWELL, R. H., and BULMER AND CO., LTD.: Hydrolysis of pectin.

541,559. BRITISH CELLOPHANE, LTD.: Moisture-proofing compositions, and articles coated therewith.

541,566. HEAVEN, H. S.: Manufacture and production of cellulosic film.

541,693. DUMBLETON, C., and BAKER PERKINS, LTD.: Endless soles for biscuit-making ovens and the like.

541,734. WOODHAMS, D. C.: Methods of and apparatus for drying material in fragmentary or like form.

541,757. HARBER, L. S., and BAKER PERKINS, LTD.: Manufacture of bread.

541,780. HARBER, L. S., POINTON, J. E., and BAKER PERKINS, LTD.: Dividing and treatment of bread and like dough.

541,953. BOLTON, J. F.: Means for lifting and delivering liquids.

541,960. PRICE, H. T.: Treatment of straw, hay, grass, reeds, and like material for the production of animal foodstuffs.

542,037. HEATHER, F.: Filters.

542,044. ROBINSON AND SON, LTD., and ROBINSON, C. S.: Roller mills for cereal grain.

542,055. BRITISH THOMSON-HOUSTON CO., LTD.: Temperature-control devices of the thermostatic type.

542,061. DOCKING, A., and BAIRD AND SONS, LTD., H.: Apparatus for roasting cereal products, coffee beans and the like.

542,062. BAILEY, W. H., and BAILEY, A.: Apparatus for rendering fats, or for cooking.

542,070. BRITISH THOMSON-HOUSTON CO., LTD.: Refrigerant evaporators.

542,125. BARKER, J.: Process for producing starchy vegetable products in dry powdered form.

542,133. EVANS, D. J.: Water purification apparatus.

542,148. BEE BEE BISCUITS, LTD., and BUXBAUM, E. K: Methods of and apparatus for packing goods in preformed flimsy containers.

542,203. FOSTER, YATES AND THOM, LTD., and LOUSLEY, N. W.: Device for filtering liquids.

542,228. BEE BEE BISCUITS, LTD., and BUXBAUM, E. K.: Method of and apparatus for handling biscuits and like articles.

Trade Marks

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SUNSPOT.—615,861. Orange juice. **The British Citrus Juice Co., Ltd.,** Furnival House, 14-18, High Holborn, London, W.C. 1; Merchants. (By Consent.)

VITZYME.—616,281. Preparations of yeast for food for human consumption. **Phillips Yeast Products, Ltd.,** Park Royal Road, London, N.W. 10; Manufacturers.

ARMADA.—616,338. All goods included in Class 30, but not including essences and flavourings. **Searle and Cushnir, Ltd.,** 22, Billiter Street, London, E.C. 3; Merchants. To be Associated with No. 612,319 (3250) xxx and another.

ORCHARD.—616,339. Custard powder, blancmange powder, cake powder, pudding powder, baking powder, flour, cornflour and ice cream powder. **Searle and Cushnir, Ltd.,** 22, Billiter Street, London, E.C. 3; Merchants. To be Associated with No. 614,658 (3295) xxx.

CHOCOLINA.—616,509. Chocolate pudding mixture. **Marshall's Malted Milk, Ltd.,** 45, Effra Parade, Brixton, London, S.W. 2; Manufacturers and Merchants.

New Companies

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Twick Products, Limited. (371369.) Mnfrs. and distributors of and dlrs. in foodstuffs, etc. £1,000. Subs.: A. J. Wheatland, D. F. Cubitt, both of Amberley House, Norfolk Street, W.C. 2 (cashiers).

Leeds Insulating Company, Limited. (371406.) 6, Park Square, Leeds, 1. To carry on bus. of mnfrs. and repairers of and dlrs. in refrigerators and cold storage appliances, etc. £100. Subs.: L. Godlove, 6, Park Square, Leeds, 1 (solr.); Evelyn Morant, 16, Woodcliffe Crescent, Chapel Allerton, Leeds, 7 (clk.).

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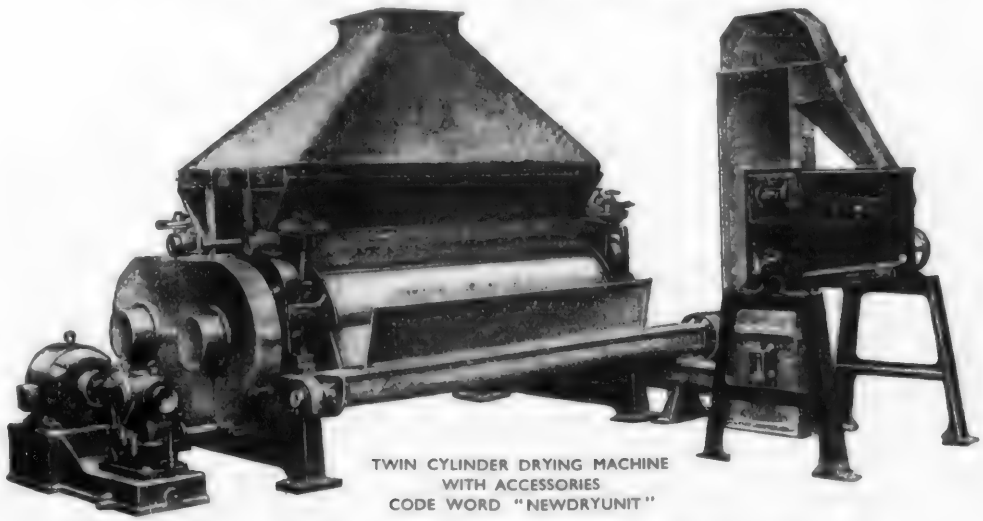

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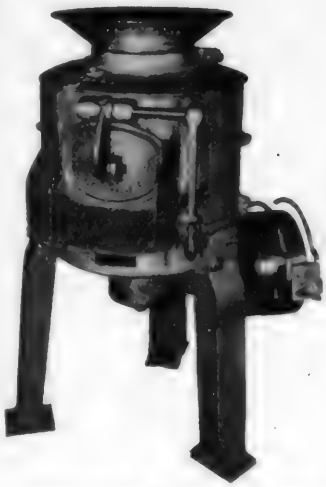

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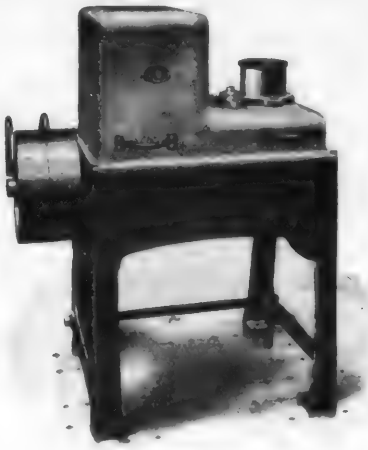

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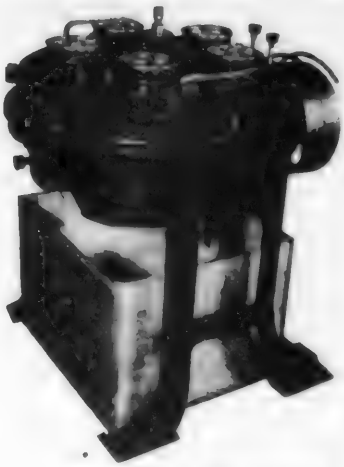

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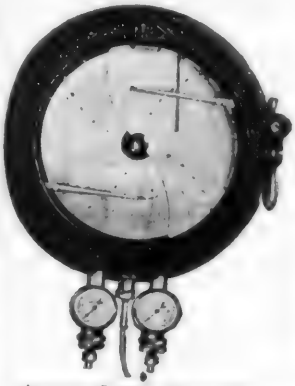

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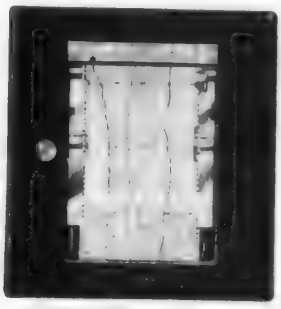

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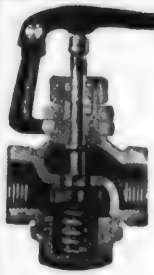

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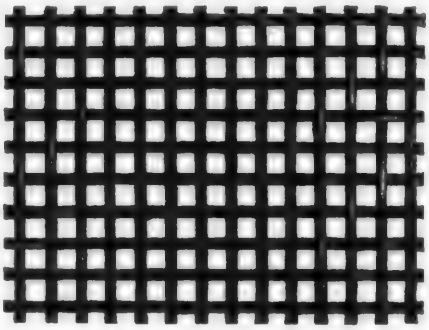

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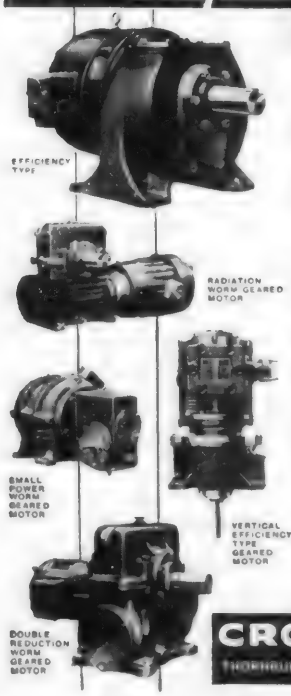
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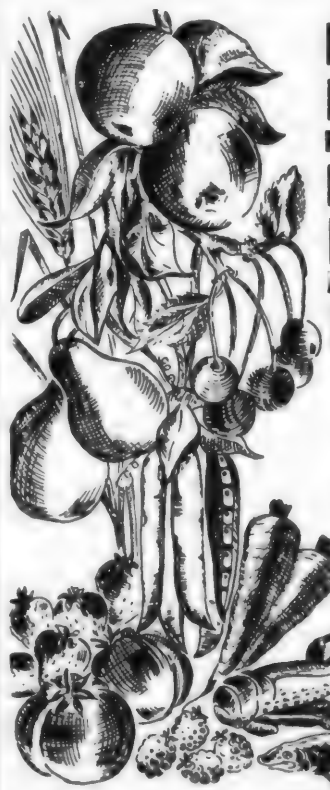

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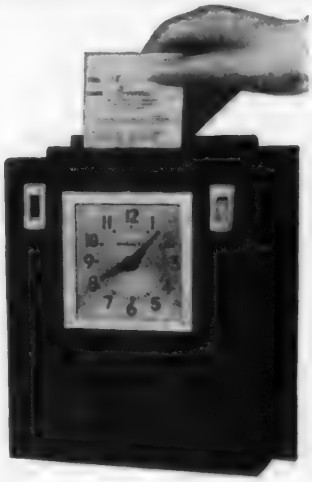

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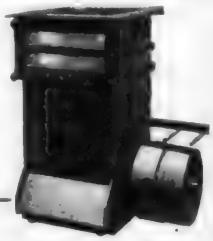

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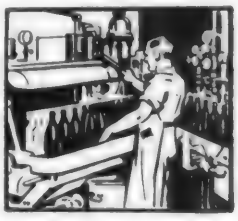

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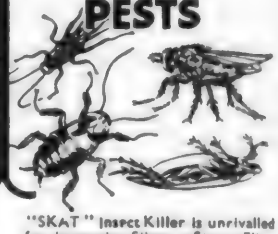

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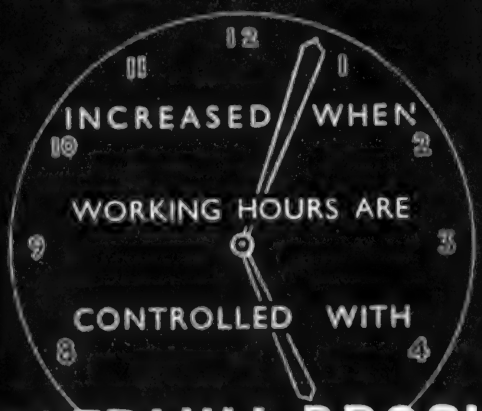

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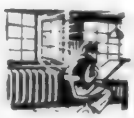

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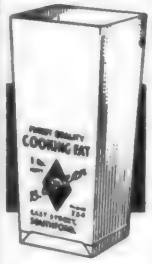

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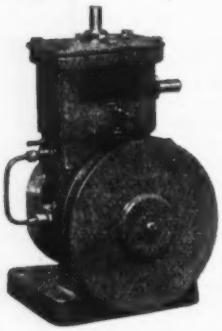

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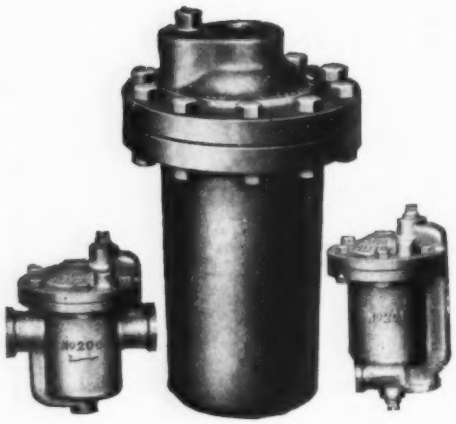

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